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EXPLORATORY LONGLINE FISHING FOR ALBACORE TUNA IN EASTERN NORTH PACIFIC WATERS DURING NOVEMBER-DECEMBER 1982

by

R. Michael Laurs and Ronald C. Dotson

ADMINISTRATIVE REPORT LJ-83-05

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SUMMARY

Five chartered commercial fishing vessels conducted exploratory operations for albacore tuna in an area approximately 1000 to 2000 miles west of Pt. Arguello, CA during November-December 1982. A total of 96 longline sets was made on the survey. Each of the vessels typically set 800 to 1400 hooks at targeted depths of 250 to 300 feet in and about the thermocline. A total of 51,377 pounds of albacore and 2,783 pounds of bigeye and yellowfin tunas was caught. Approximately one-third of the total albacore landings (by weight) were fish taken on trolling gear mostly in transit to the longline fishing areas. Individually, the vessel landings ranged from 8,276 to 14,255 pounds of all tunas combined. Daily longline catches ranged from 0 to 84 albacore per vessel. The mean catch rate of albacore for all vessels was about 1.5 fish/100 hooks (1.6 if other tunas are included). The average catch rate among vessels ranged from about 1.0 to 2.9 albacore/100 hooks.

There was a significant loss of fish due to tangled gangions and/or lost hooks by some vessels. The loss of fish due to tangled gangions, approximately 20 percent of one vessel's catch, is believed to have resulted from the use of "fixed" gangion type of longline gear. Vessels using snap-on gangions with swivels experienced only about a 5 percent fish loss due to tangles. The fish loss due to lost hooks, 25 and 29 percent of the catch for two vessels, was traced to slightly oversized nicropress sleeves used in attaching hooks to the gangions which allowed the monofilament nylon gangion material to pull out and the hook to be lost.

Experiments showed that higher catch rates were made using 400 pound test monofilament nylon line for main line than 1/4-inch polypropylene line. The mean catch rate for 17 sets (2085 hooks) using monofilament nylon was 4.2 fish/100 hooks and for 17 sets (9363 hooks) using polypropylene was 2.6 fish/100 hooks.

Measurements of the amount of sag in the longline gear after it has been set showed that there may be considerable sag in the main line. This was as much as 25 percent of the main line length between floats. Because of the excessive sag, it is believed that the majority of the hooks on most sets fished below the targeted depth of the thermocline where it has been recently shown that albacore generally reside.

Inclement weather conditions drastically reduced effective fishing effort. During the survey the winds were in excess of 20 knots for 53% of the days the vessels operated. On a number of days the winds exceeded 45-50 knots. Most of the rough seas and high winds were associated with Hurricane Ewa, the first hurricane to hit the Hawaiian Islands since the early 1950's. The path followed by Ewa passed over the area where the exploratory albacore longline operations were planned. This prevented vessels from operating in the planned area except for seven days. Albacore catch rates during the limited days that the boats were able to operate in the targeted area averaged over 4 fish/100 hooks as opposed to about 1 fish/100 hooks on other days. The rough weather conditions also limited the amount of gear that the fishermen could fish effectively. In addition, adverse weather conditions precluded acoustic tracking experiments by NMFS scientists to investigate the swimming depths and ocean temperature relationships of albacore during the longline survey.

INTRODUCTION

The objective of this study is to evaluate the potential for establishing a U.S. fishery on North Pacific albacore during winter months in eastern North Pacific waters. An area several hundred miles off the coast of southern California and extending to the longitudes of about the Hawaiian Islands was selected for the study. The purposes of the study were: 1) to conduct exploratory fishing using longline fishing methods to determine if sufficient catches of albacore can be made to support an expansion of the U.S. fishery, 2) to make scientific observations to determine oceanographic conditions that may influence albacore distribution and catchability in the area, and 3) to collect scientific data for albacore biology and fishery studies. The scientific observations included: (a) vertical temperature profiles and surface ocean temperature measurements, (b) albacore tagging for migration and stock structure studies, (c) collection of detailed records on fish catch, amount of gear fished, modifications made to fishing gear and fishing tactics, and size composition of tuna caught, and (d) experiments to measure the depth distribution of longline gear during a set.

This study was conducted cooperatively between the National Marine Fisheries Service, Southwest Fisheries Center (SWFC) in La Jolla, California and the U.S. albacore fishing industry's American Fishermen's Research Foundation (AFRF). Saltonstall-Kennedy (S-K) funds managed by the NMFS Southwest Regional Office in Terminal Island, California and awarded to the AFRF were used to charter fishing vessels and finance other costs. The operational aspects of the study were carried on by the AFRF and managed by the Western Fishboat Owner's Association (WFOA), a west coast association of albacore fishermen. Fishery scientists at the SWFC planned the study and worked with the AFRF and WFOA to organize it. In addition, the SWFC provided scientific equipment. Fishery scientists were aboard three of the chartered fishing vessels to make scientific observations and to keep detailed records related to the fishing operations and catch.

BACKGROUND INFORMATION

The U.S albacore fishery has traditionally operated during summer and fall months, usually within a few hundred miles of the North American coast. In some years it extends as far south as central Baja California, Mexico and as far north as northern British Columbia, Canada. In recent years U.S. fishermen have also begun to fish for albacore from near the dateline and eastward during early spring and summer months.

The AFRF has been awarded three S-K grants for studies of exploratory longlining fishing operations. Each of these has been conducted cooperatively with the NMFS/SWFC. The first study, conducted in January-February 1981, investigated the possibilities of expanding the U.S. albacore fishery to operate outside the traditional summer and fall seasons using longline fishing methods. The results of the first study showed that it was feasible for U.S. fishing vessels in the 50 to 80 foot size-class to longline for albacore during the winter months. A limited quantity of gear was deployed with subsequent small catches in 1981; however, the catch rates were sufficiently high to suggest that a profitable winter albacore fishery could be developed.

The second study was designed to expand upon the 1981 findings. The amount of gear deployed was increased to reflect potential commercial efforts and a fishing strategy was proposed based upon associations of catch and subsurface thermal structure found in the first survey.[1] This third study was designed to evaluate distribution and catch rates in November-December. Historical records on Japanese longline catches show high catch rates in November and December and on the average slightly better weather might be expected.

METHODS

FISHING VESSELS

Five commercial fishing vessels were selected by competitive bid for charter by the AFRF. The vessels received $25,000 in charter fees, up to $7,500 for fuel costs, and 2.5 tons of squid for longline bait. The fish catch, except for one ton per vessel which reverted to the AFRF, was retained for sale by the individual vessels.

The names of the fishing vessels, captains, home ports and lengths are shown in Table 1 along with the names of SWFC personnel who made scientific observations aboard three of the vessels.

Table 1. Fishing Vessels Chartered for Study.

Vessel Name	Captain	Home Port	Vessel Length	SWFC Observer
Alaska	Palmer Pedersen	Seattle, WA	65 ft.	
Arrow	David Kelly	Sitka, AK	70 ft.	
Norcoaster	Elwin Cox	Fort Bragg, CA	70 ft.	Ron Dotson
Pacific Pioneer	Frank Barone	Honolulu, HI	75 ft.	Bob Nishimoto
Resolute	Byron Bassi	Seattle, WA	72 ft.	Dimitry Abramenkoff

AREA AND DATES OF STUDY

Field operations were conducted between November 12 and December 16, 1982. Longline fishing was centered in an area between about 34° to 36°N and 138° to 158°W, which is approximately 1,000 to 2,000 miles west of Pt. Arguello, CA. A drawing of the cruise tracks and the area where most longline operations were centered is shown in Figure 1.

[1]Reports of the results are found published in NOAA Technical Memorandum NMFS-SWFC-10, 1981, "Albacore trolling and longline exploration in eastern North Pacific waters during mid-winter 1981" and NMFS/SWFC Administrative Report LJ-82-06, 1982.

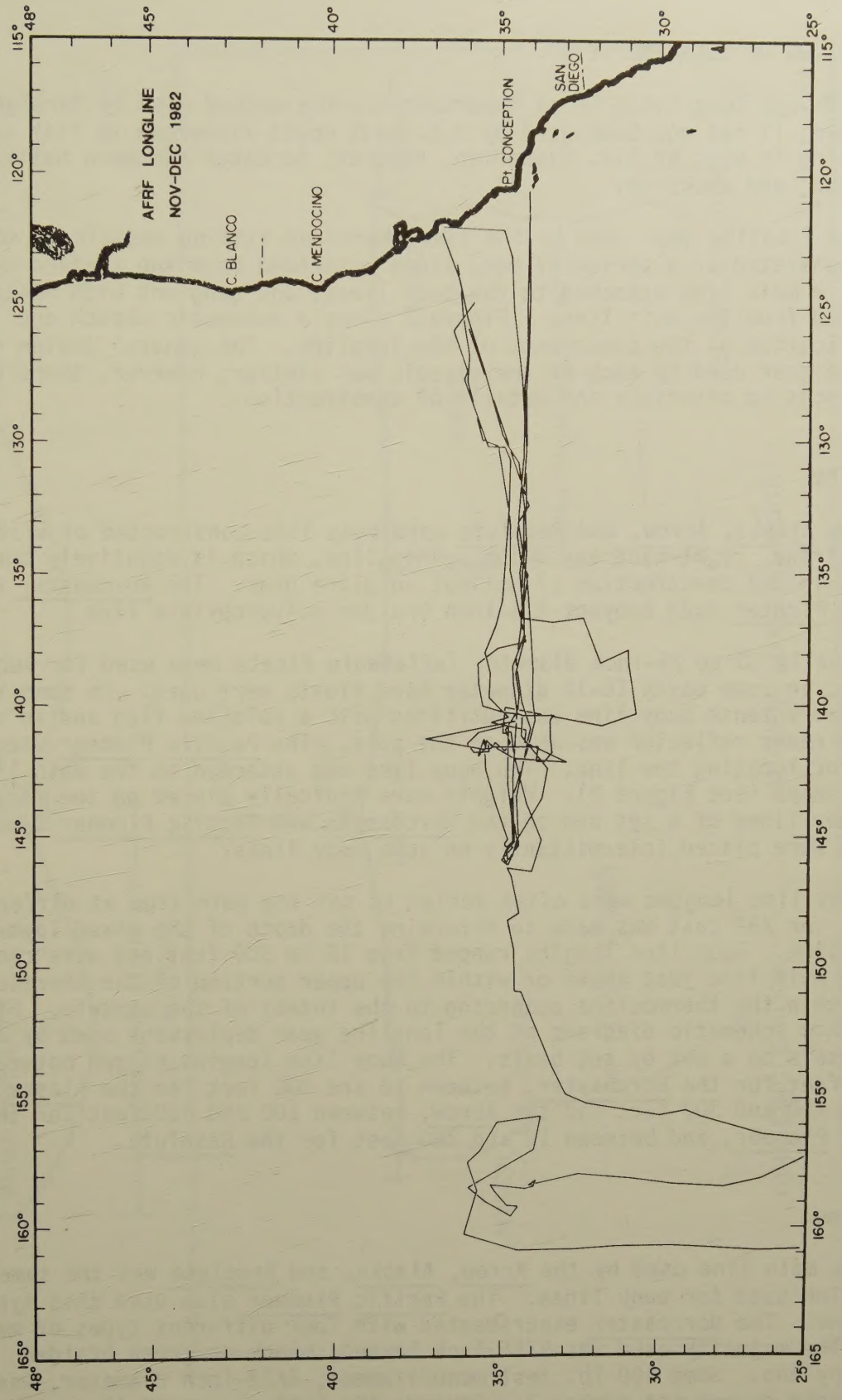


Figure 1. Cruise tracks of the five AFRF chartered longline vessels in November-December 1982.

DESCRIPTION OF LONGLINE GEAR

Although longlining is an important fishing method used by foreign tuna fishermen, it has not been used by U.S. west coast fishermen to fish for tuna. Longlining is used by U.S. fishermen, however, to catch northern halibut, black cod, and rockfish.

The longline gear used by the five chartered fishing vessels in this study consisted of a series of buoy lines suspended from the surface by floats, a main line attached to the buoy lines, and gangions with baited hooks suspended from the main line. Figure 2 gives a schematic sketch and identification of the components of the longline. The general design of the longline gear used by each of the vessels was similar; however, there were differences in materials and details of construction.

Buoy Line

The Alaska, Arrow, and Resolute used buoy line constructed of 5/16-inch, three strand, right-hand lay nylon. This line, which is negatively buoyant, is used in the construction of halibut longline gear. The Norcoaster and Pacific Pioneer used buoyant 1/4-inch braided polypropylene line.

Usually 10 to 24-inch diameter inflatable floats were used for buoys, however, in some cases 10-14 diameter hard floats were used. On some vessels, about every tenth buoy line was outfitted with a pole and flag and in some cases a radar reflector was used on the pole. The Pacific Pioneer used radio buoys for locating the line. The buoy line was attached to the main line with salmon snaps (see Figure 2). Weights were typically placed on the first and last buoy lines of a set and on the Norcoaster and Pacific Pioneer 2-pound weights were placed intermittantly on some buoy lines.

Buoy line lengths were often varied to set the main line at different depths. An XBT cast was made to determine the depth of the mixed layer and thermocline. Buoy line lengths ranged from 18 to 300 feet and were chosen to set the main line just above or within the upper portion of the thermocline or deep within the thermocline according to the intent of the captain. Figures 3a-3e show schematic diagrams of the longline gear deployment used by each of the vessels on a set by set basis. The buoy line lengths ranged between 18 and 72 feet for the Norcoaster, between 18 and 300 feet for the Alaska, between 150 and 300 feet for the Arrow, between 100 and 400 feet for the Pacific Pioneer, and between 18 and 300 feet for the Resolute.

Main Line

The main line used by the Arrow, Alaska, and Resolute was the same 5/16-inch nylon used for buoy lines. The Pacific Pioneer also used this type of main line. The Norcoaster experimented with four different types of main line. The majority used was 5/16-inch leaded, black or green braided polypropylene. Some 400 lb. test monofilament, 3/32-inch diameter, was used on all sets except set number 3. Towards the latter part of the cruise some 1/4-inch orange braided polypropylene was used, usually with weights placed at

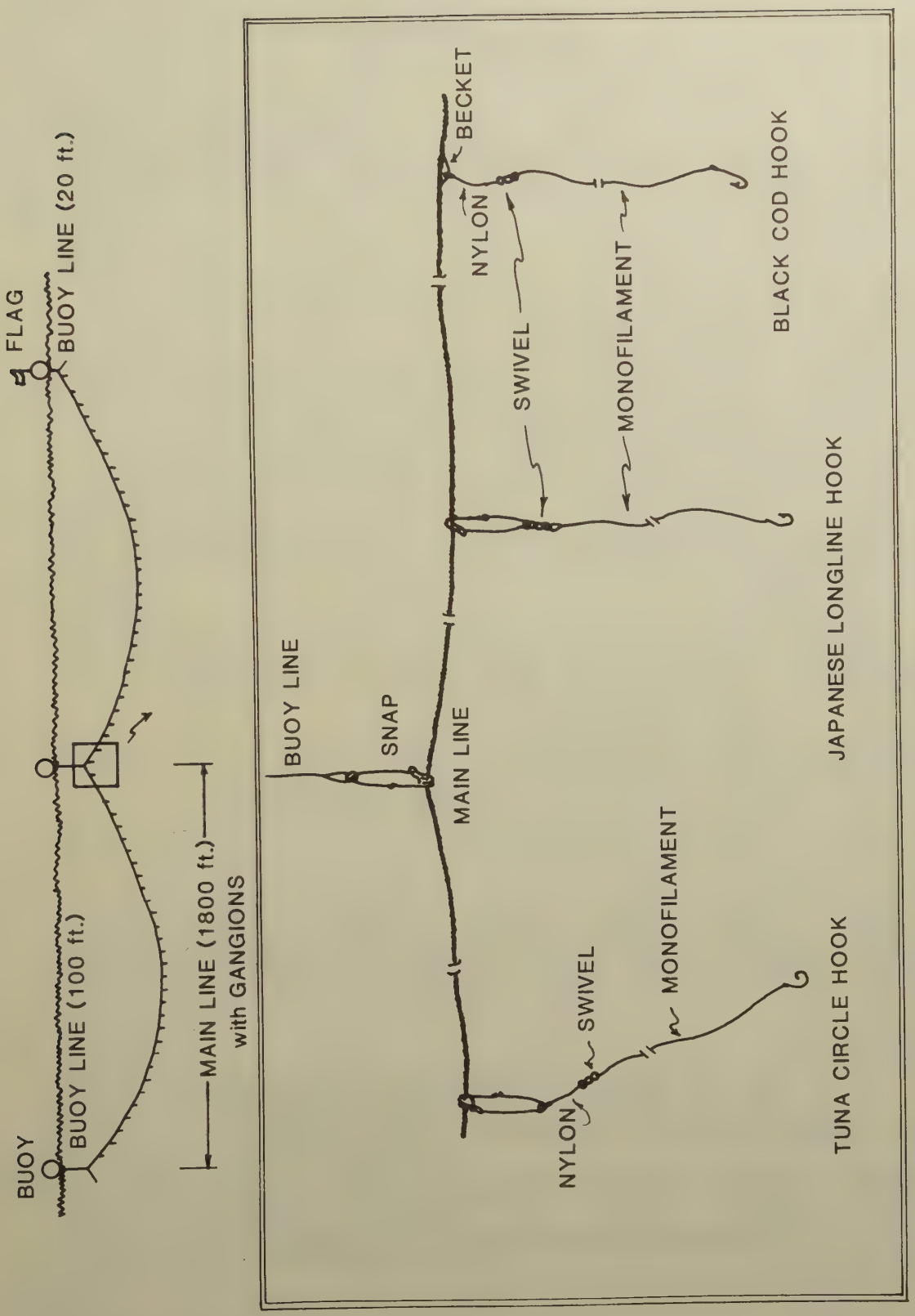


Figure 2. Longline and detail of the gangion configurations used by the various vessels during November-December 1982.

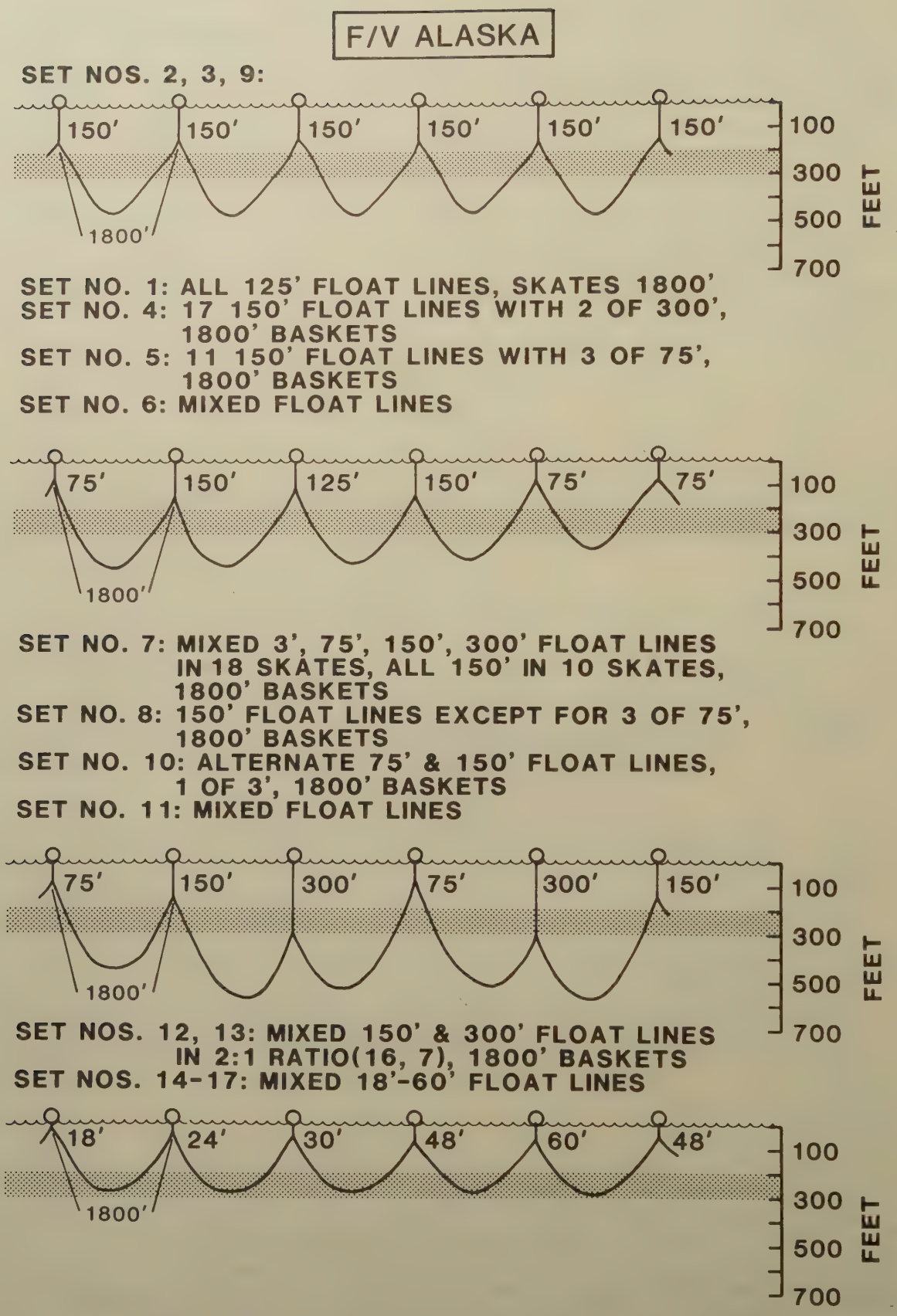
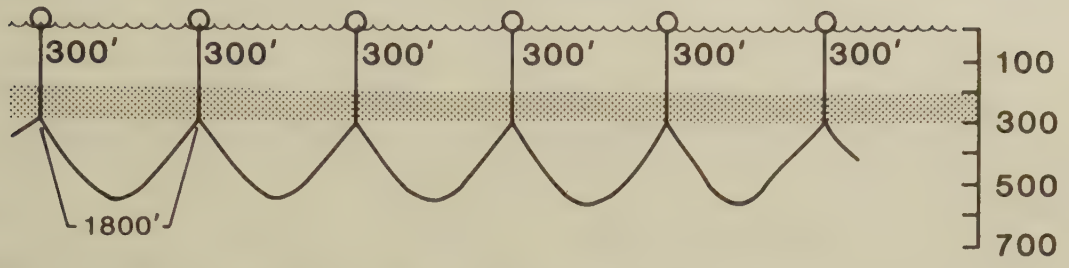


Figure 3a. Schematics of setting configurations used by vessels in November-December 1982. Main line sag was estimated as 17% of the basket length (from present study) and the approximate depth of the thermocline is indicated by shading.

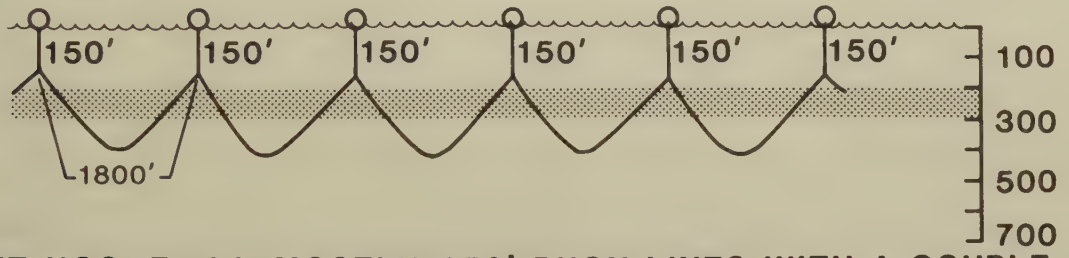
F/V ARROW

SET NOS. 1, 2, 19:



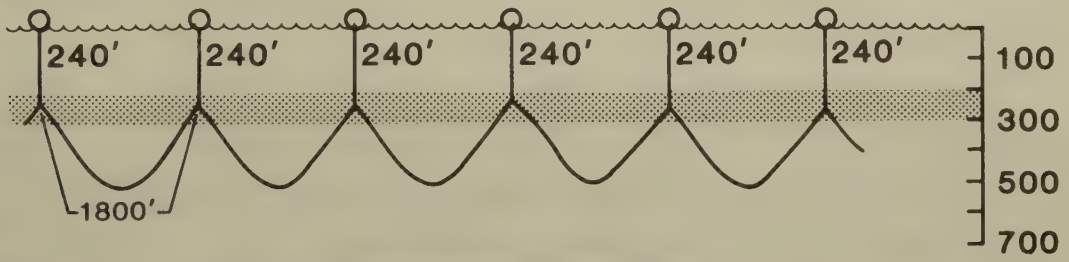
SET NO. 3: 3 BUOY LINES OF 300', 22 OF 210', 5 OF 300', 1800' BASKETS
SET NO. 4: 11 BUOY LINES OF 210', 1 OF 300', 1 OF 210', 10 OF 300', 1800' BASKETS
SET NO. 5: 10 BUOY LINES OF 450', 16 OF 600'

SET NOS. 6, 15, 16:



SET NOS. 7, 14: MOSTLY 150' BUOY LINES WITH A COUPLE OF 300' AT THE END, 1800' BASKETS

SET NOS. 8-10, 12:

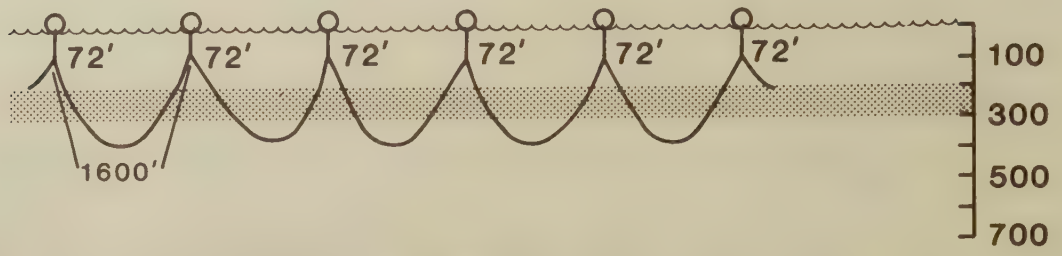


SET NO. 11: 25 BUOY LINES OF 240', 8 OF 150', 1800' BASKETS
SET NO. 13: 8 BUOY LINES OF 240', 8 OF 150', 7 OF 300', 1800' BASKETS
SET NO. 17: 9 BUOY LINES OF 240', 13 OF 300', 1800' BASKETS
SET NO. 18: 17 BUOY LINES OF 450', 5 OF 300', 1800' BASKETS

Figure 3b. Schematics of setting configurations used by vessels in November-December 1982. Main line sag was estimated as 17% of the basket length (from present study) and the approximate depth of the thermocline is indicated by shading.

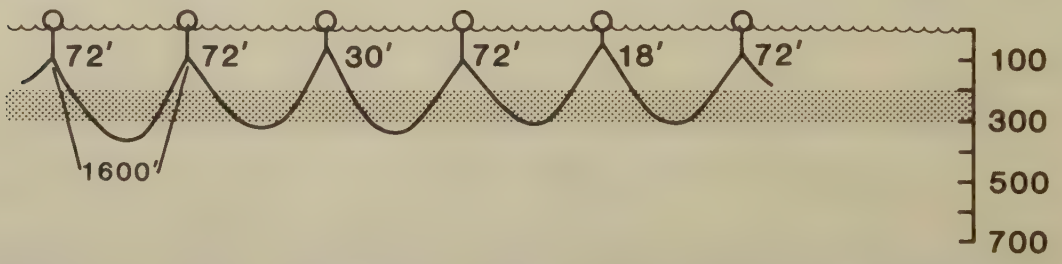
F/V NORCOASTER

ALL SETS: BASKETS PRIMARILY 1600', 1640' ON 5 MONOFILAMENT BASKETS AND 1600'-1800' ON 1-5 BASKETS OF BUOYANT POLYPROPYLENE (later sets)
SET NOS. 2-9: SEE VARIATIONS LISTED BELOW



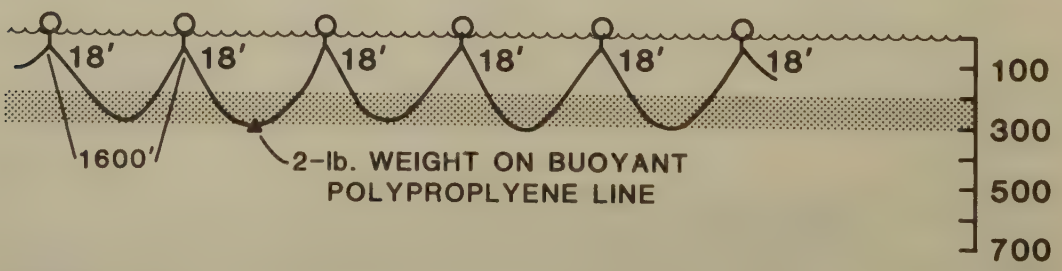
SET NO. 1: ALL 150' FLOAT LINES
SET NO. 3: 4 SKATES OF 23 HAD A 4" FLOAT IN CENTER
SET NO. 4: 2 FLOAT LINES OF 42'
SET NO. 9: 3 SKATES HAD 4" FLOAT IN CENTER

SET NOS. 10-12:



SET NOS. 10, 11: 3 72' FLOAT LINES TO EACH SHORTER FLOAT LINE. SOME BUOY LINES WITH 2 lb. WEIGHT
SET NO. 12: 1 72' FLOAT LINE TO 2 SHORTER FLOAT LINES. SOME BUOY LINES WITH 2 lb. WEIGHT

SET NOS. 13, 14:



SET NOS. 15-17:

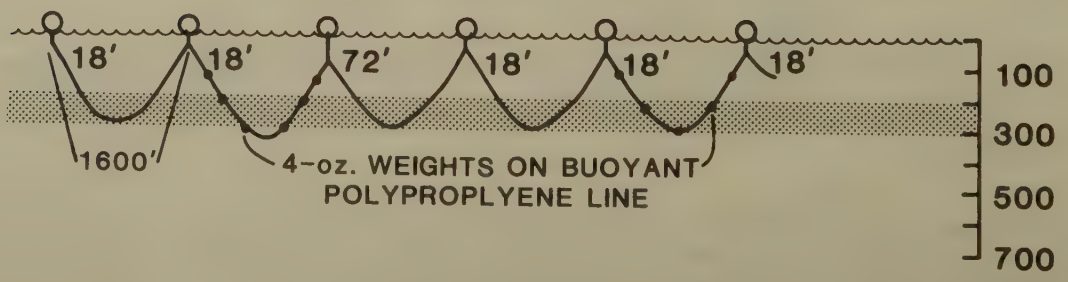
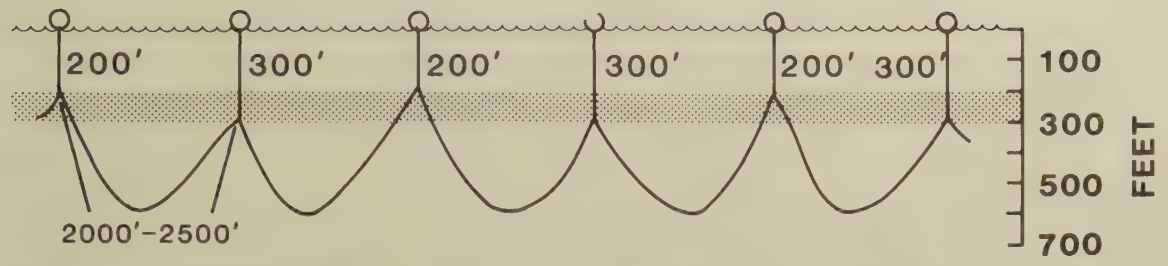


Figure 3c. Schematics of setting configurations used by vessels in November-December 1982. Main line sag was estimated as 17% of the basket length (from present study) and the approximate depth of the thermocline is indicated by shading.

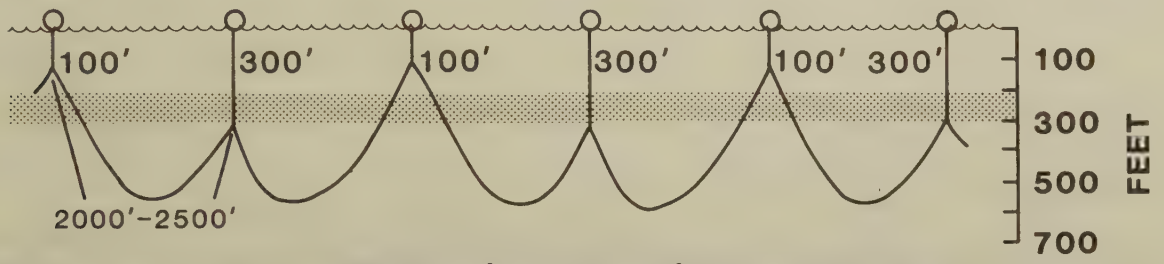
F/V PACIFIC PIONEER

SET NOS. 3, 4, 7, 12-17, 19-23:



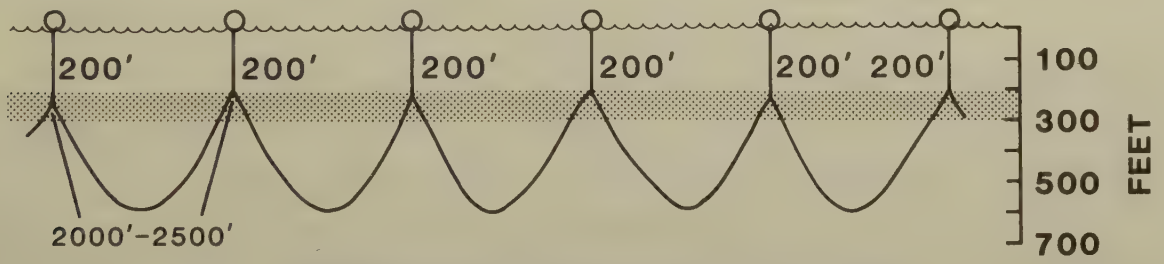
SET NO. 1: ALTERNATE TWO 200' AND ONE 300' FLOAT LINES, 2000'-2500' BASKETS
SET NO. 2: ALTERNATE 100' AND 200' FLOAT LINES : 2000'-2500' BASKETS

SET NO. 5:



SET NO. 6: ALTERNATE 200' AND 400' FLOAT LINES: 2000'-2500' BASKETS

SET NOS. 8, 9 AND 11:



SET NO. 10: SIX CONSECUTIVE 100' FLOAT LINES: 2000'-2500' BASKETS
SET NO. 18: ALTERNATE 300' AND 400' FLOAT LINES: 2000'-2500' BASKETS
SET NO. 24: ALL 300' EXCEPT ONE 400' FLOAT LINE: 2000'-2500' BASKETS

Figure 3d. Schematics of setting configurations used by vessels in November-December 1982. Main line sag was estimated as 17% of the basket length (from present study) and the approximate depth of the thermocline is indicated by shading.

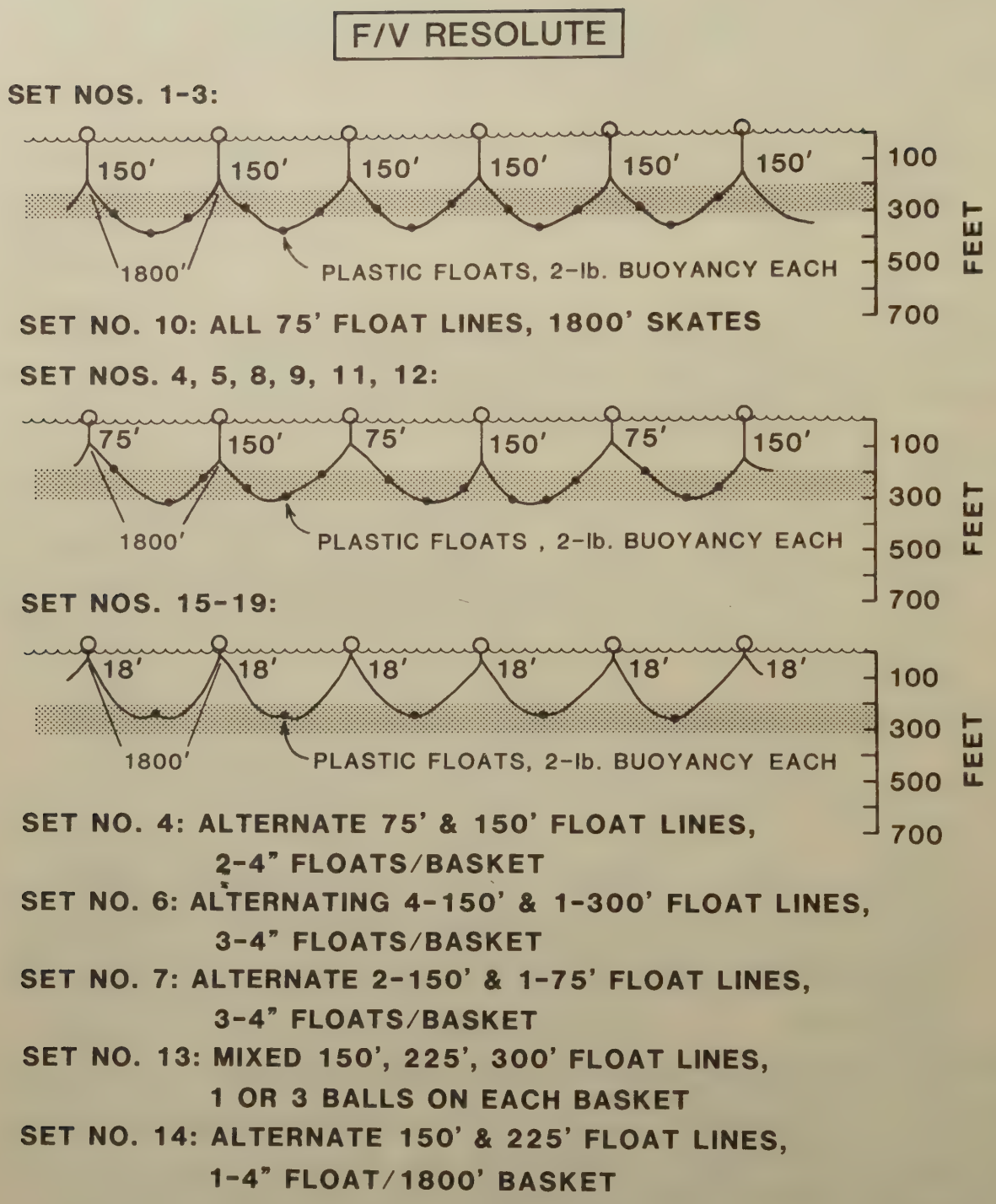


Figure 3e. Schematics of setting configurations used by vessels in November-December 1982. Main line sag was estimated as 17% of the basket length (from present study) and the approximate depth of the thermocline is indicated by shading.

intervals along the line to make it negatively buoyant. On sets early in the cruise one or two baskets of 5/16-inch, 3-strand, twisted nylon was used. Stops, consisting of tape wrapped on the line or nylon cord tied or whipped to the line were placed at 10 fathom intervals on the main line used on the Norcoaster to meter hook placement and prevent gangions from sliding together.

In a longlining configuration the length of line between floats (or weights) is termed a basket or skate. In halibut fishing a "standard" skate is 1800 feet which is the length of line commercially available in coils. Because some of the chartered vessels used differing lengths of line between floats we have chosen to use the term basket to avoid the frequent acceptance of a skate being 1800 feet long.

The Pacific Pioneer used 2000-2500 foot baskets and the Arrow, Alaska and Resolute used 1800-foot baskets. The Norcoaster used 1600 foot monofilament and leaded polypropylene baskets and 1800 foot 3-strand nylon.

The Norcoaster typically fished about 26 to 28 baskets per set, the Alaska about 22-27, the Resolute about 24 to 25, the Alaska about 22 to 27 and the Pacific Pioneer about 21 to 24.

Gangions

The Resolute used "fixed" gear with the gangions tied directly to the main line while the other four vessels used "snap-on" gear with each gangion connected to a snap so it could be connected or removed from the main line.

The gangions on the Resolute consisted of 42-inch, 300 lb. test monofilament with a hook connected by a nicopress sleeve and a barrel swivel tied at the other end. A 6-inch, 3/32-inch piece of braided nylon was tied to the swivel and the other end tied to a "becket" of braided nylon spliced into the main line. The overall length of the gangion was 4 ft. and it could not be removed without untying or cutting it free.

The snap-on gear was constructed by tying one end of the monofilament to a swivel/snap combination and the hook was attached on the other end with nicopress sleeves. The gangions on the Arrow were 6-foot long and constructed of 300 lb. test monofilament. Those on the Alaska were 4 to 6 foot of 220 to 300 lb. test monofilament. The Pacific Pioneer used gangions 8 to 12 foot long of 300 lb. test monofilament and some of two strands of 200 lb. test monofilament twisted together. The Norcoaster used 220 to 300 lb. test monofilament on gangions of 5 to 6 foot. The different types of gangions are illustrated in Figure 2.

Hooks

The Alaska used No. 7 Mustad tuna circle hooks and the Arrow used No. 5 Mustad circle hooks. The Resolute used No. 7 Mustad circle hooks and some Mustad No. 9 black cod hooks after set number 2. On the Norcoaster No. 7 and No. 4 Mustad circle hooks were used with a few dozen No. 34 Japanese longline hooks. The Pacific Pioneer used No. 8 Mustad circle hooks, No. 34 Japanese longline hooks and No. 30 Japanese circle hooks.

The circle hooks used on the Arrow and the majority of the circle hooks on the Norcoaster and Pacific Pioneer were modified so that the points were offset about 1/4-inch from alignment with the shank.

Bait

Frozen squid were used for bait. The squid were 5 to 8-inches long and counted 5 to 8 per pound. In addition some artificial plastic squid and modified hoochies were used with very little success.

There were differences in the baiting methods used by the vessels. The Arrow and Pacific Pioneer baited during the set and baits were not re-used. The Alaska and the Norcoaster baited during the haul with partially thawed bait and then held the baited gear in the hold at temperatures below freezing. Baits were not re-used on the Alaska, however, on the Norcoaster baits that appeared in good condition were occasionally re-used during the early part of the trip. The Resolute usually baited as the gear was hauled and left the baited gear overnight on the deck, and sometimes 200 to 300 hooks were baited with freshly thawed bait the morning of the set.

SETTING THE LONGLINE

All the vessels set the line from the stern. The Arrow, Alaska and Pacific Pioneer set from a reel. The Norcoaster set gear out of tubs and the Resolute set the gear down a trough.

On vessels where the hooks were baited during the haul of the previous set, the containers holding the baited gangions were placed near the stern and two men were used for attaching the baited gangions to the main line. On those vessels where baiting was done during the set, either 1) the bait was placed on a baiting table or trough near the stern with the containers holding the gangions nearby and two or more men would do baiting of the hooks and attach the gangions to the main line; or 2) the hooks would be baited by one crewman, then baited gangions in containers were placed near the stern where two crewmen attached them to the main line. It was necessary for some of the crewmen that were baiting to wear waterproof gloves in order to prevent sores and infection on their hands caused by excessive contact with the juices from the squid.

The boats proceeded at a speed of 5 to 8 knots while setting the gear and usually less than two hours were required to complete each set. Most of the sets were started between 0730 and 0930 PST. The direction that the gear was set varied depending on sea and wind conditions and was also varied to test the relation of fishing success to the direction of set. Information concerning setting the gear is given in Appendix 1.

HAULING IN THE LONGLINE

The haulback was started 2 to 4 hours after the last buoy was set. The last basket of gear set was picked up first on the Alaska and usually on the Norcoaster. The first basket set was picked up first on the Arrow, and on the

Resolute the first basket set was picked up first about 1/3 of the time and the last basket set was picked up first about 2/3 of the time. The Pacific Pioneer hauled from the last buoy set the first half of the cruise, and then began hauling from the first buoy set. A line hauler or hydraulic reel was used to haul the main line. The main line was brought over a fairlead roller attached to the rail and led through a block(s) to the puller or reel. Figure 4 shows schematics of the hauling configurations used by various vessels. Buoy lines were retrieved using a hydraulic tuna line puller or net puller.

The speed of the vessel and the puller or reel were adjusted in attempts to reduce tension on the main line. However, this was not always successful and excessive strain sometimes seemed to cause the main line to twist as it was hauled. Twisted gangions were stripped off by unclipping or cutting them and then pulling at 90° to the main line until they were free. This slowed the hauling operations and often caused damage to the gangion material (kinks, knots, etc.). In addition, fish on those gangions that twisted about the main line sometimes broke free or fell off at the boat (see Appendix 1).

Tuna that were caught on the longline were brought on board the vessels with a gaff. The time required to complete the hauling operations ranged from about 4 to 10 hours (see Appendix 1).

TROLLING

The vessels used conventional albacore trolling jigs and usually trolled in a straight line without circling except on a few occasions. Each vessel trolled from 6 to 10 lines from about dawn to dusk, 10 to 12 hours per day, while in transit to and from the area where longline fishing was centered (see Figure 1). Vessels occasionally trolled in the vicinity of the longline gear while the gear was "soaking" and on days when weather conditions were too rough to set longline gear.

SCIENTIFIC OBSERVATIONS

Ocean Temperature Measurements

Vertical profiles of ocean temperature down to approximately 1500 feet were measured with an Expendable Bathythermograph (XBT) System (Sippican Mark 4 Recorder and T4 Probe). XBT drops were made by each vessel[2] usually once a day when troll fishing was conducted, and up to several XBT drops were made in conjunction with each longline set. Sea surface temperature (SST) measurements were monitored frequently on the vessels using electronic thermometers with readouts in the wheelhouse or by using a bucket thermometer.

Fish Tagging

Floy, spaghetti-dart tags were used to tag a selected number of albacore. Fork Fork length measurements, to the lower whole centimeter, were made on each fish tagged and released, and the position, date, and SST were also recorded.

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[2]The XBT on the Alaska did not function properly.

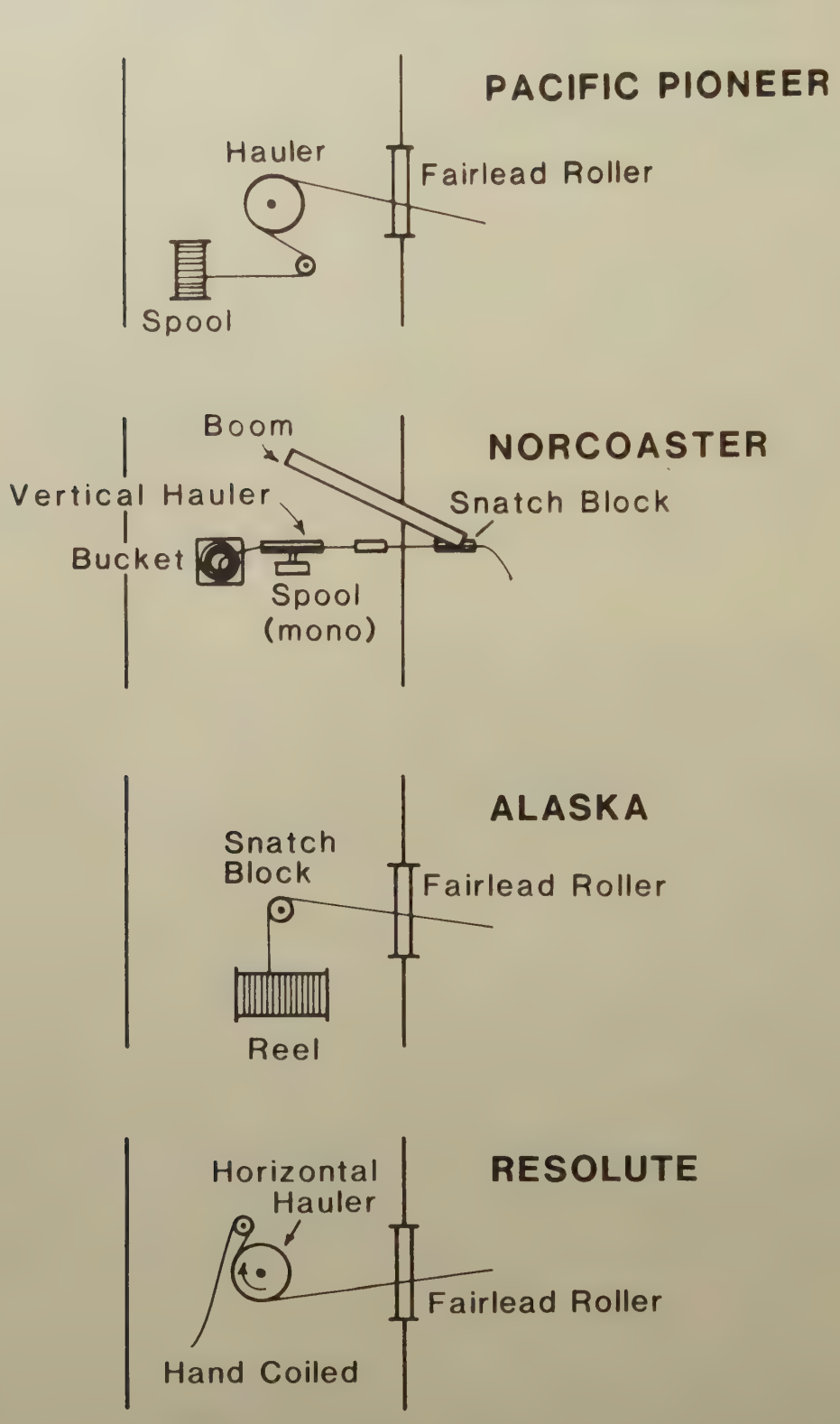

Figure 4. Hauling configurations used by vessels in November-December 1982.

Records of Catch and Effort

Records of the longline fishing were kept on each vessel. These records usually included: date, times and locations at the start and completion of the set, haulback time, number of baskets of main line used, depth of buoy lines and distance between buoy lines, quantity and type of materials, lengths of gangions, type of bait, and weather and sea conditions. In addition, special records were kept on the Norcoaster, Pacific Pioneer and Resolute for each hook as the longline was hauled. This information included presence or absence of bait on the hook, hook lost or straightened, species of fish caught, observed loss of fish during hauling and malfunctions in the gear.

On days when only troll fishing operations were conducted, records were kept on the date, times and locations at the start and finish of trolling, and numbers of fish caught. When trolling was conducted in conjunction with a longline set, only the general location of the trolling and total number of fish caught were recorded.

Size Measurements of Tuna

On the Norcoaster, Pacific Pioneer and Resolute fork length measurements were made on all tuna caught. On the other vessels fish weights were estimated and the range and predominant size noted for each day's catch.

Other Observations

Surface weather observations were recorded in conjunction with XBT drops and longline sets. Incidental sightings of marine mammals and sea birds were noted, however, no regular watch was maintained to make these types of observations.

Acoustic Tracking of Albacore

Acoustic tracking operations were not conducted because of rough seas and poor weather conditions.

RESULTS

ALBACORE CATCHES MADE BY LONGLINE

Albacore Catches by Number and Weight

A summary of the longline catch and effort of albacore, bigeye and yellowfin tunas by vessel is given in Table 2. The catch of albacore by longline for all vessels was approximately 34,000 pounds. An additional 17,000 pounds of albacore were taken on trolling gear for a total albacore catch of 51,377 pounds. By vessel, the total albacore catch ranged from 8,191

TABLE 2. SUMMARY OF CATCH AND EFFORT BY VESSEL DURING THE NOVEMBER-DECEMBER 1982 LONGLINE CHARTER.

VESSEL	# SETS	RANGE OF HKS/SET	RANGE OF ALB/SET	AVG. ALB/100 HKS	TOTAL ALB (LL)	TOTAL ALB (TROLL)	TOTAL YF & BE	WT. ALB.	WT. BE & YF
PAC. PIONEER	24	700-1152	0-84	1.73	410	1	20	13,464	791
NORCOASTER	17	313-812	0-62	2.86	327	415	5	10,648	141
RESOLUTE	19	290-1434	0-27	0.95	164	390	3	8,191	85
ALASKA	17	272-1497	0-39	1.19	188	484	21	10,216	592
ARROW	19	675-1300	0-43	1.19	225	343	36	8,858	1,174
TOTAL (ALL BOATS)	96	87,158[1] TOTAL HOOKS		1.51	1,314	1,633	85	51,377[2]	2,783
					2,947				

[1] 1,506 ARTIFICIAL LURES INCLUDED.

[2] FROM THIS WEIGHT APPROX. 36% IS TROLL FISH AND 64% LONGLINE FISH.

pounds to 13,464 pounds. In numbers there was a total of 1,314 albacore taken in 96 longline sets. Average hook rates per boat ranged from about 1.0 to 2.9 albacore per 100 hooks. The group average was 1.5 albacore per 100 hooks or 2.0 albacore, bigeye and yellowfin tuna per 100 hooks.

Geographical Variations

Summaries of longline catch and effort for albacore by 1/2-degree squares in the area where the longline fishing was centered are shown in Figure 5a-c. The top panel of each Figure presents the number of sets, the mean catch per 100 hooks, total catch in numbers of albacore and total number of hooks fished.

The distribution of fishing effort was uneven and limited over the area. Consequently, conclusions about the distribution of catches and hook rates cannot be drawn with confidence. The albacore catch rate in the area between 155° to 165°W ranged from 0.13 to 4.26 fish/100 hooks; in the area between 145° to 155° W ranged from 0.62 to 5.08/fish/100 hooks; and in the area between 135° to 145°W ranged from 0.29 to 1.61 fish/100 hooks. The area between 145° to 155°W yielded consistently higher catch rates of albacore than the areas further inshore or offshore. In general catch rates were higher north of 34°N than south of 34°N.

Size Composition

The size composition of albacore caught by trolling and by longline aboard the Norcoaster, Pacific Pioneer and Resolute are shown in Figure 6. The troll-caught fish were smaller than the longline-caught fish. The troll-caught fish fell into about three size groups--about 6 to 9 pounds, 11 to 15 pounds, and larger. The longline-caught fish ranged in size from 6 to 75 pounds and were distributed in several size groups--small numbers of 6 and 10 to 16 pound fish, relatively large numbers of 20 to 30 and 35 to 45 pound fish and small numbers of fish larger than 50 pounds.

There were some differences in the weight of fish caught by the vessels with the Pacific Pioneer catching larger fish by longline than the Norcoaster or the Resolute.

Fishing Depth of Longline Gear

The operative fishing depth of the longline gear is influenced by a number of factors including the length of buoy lines, use of weights, effectiveness of floats, weight of fishing equipment on the main line, currents, etc. In an attempt to measure sinking rates and configurations of the main line acoustic pingers were attached on a limited number of longline sets made by the Norcoaster.

The sag in the main line is defined as the difference in depth between the center of a basket and the length of buoy lines supporting it. Data from a few sets on the January-February 1982 study indicated that there were 250 to 300 feet of sag in 1800 ft. baskets. In the recent study the measured sag was

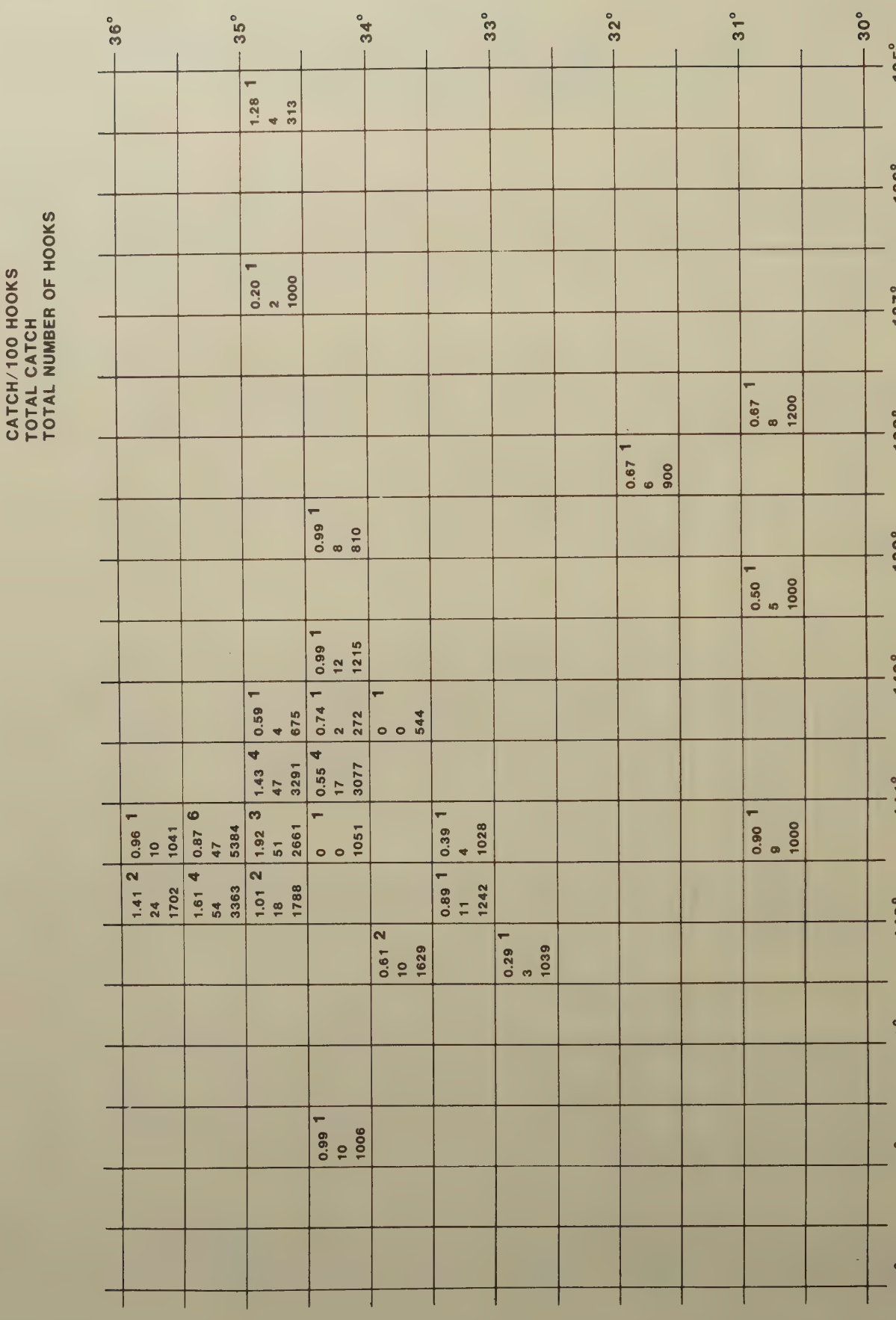

Figure 5a. Summary of catch & effort by 1/2-degree square for all vessels.

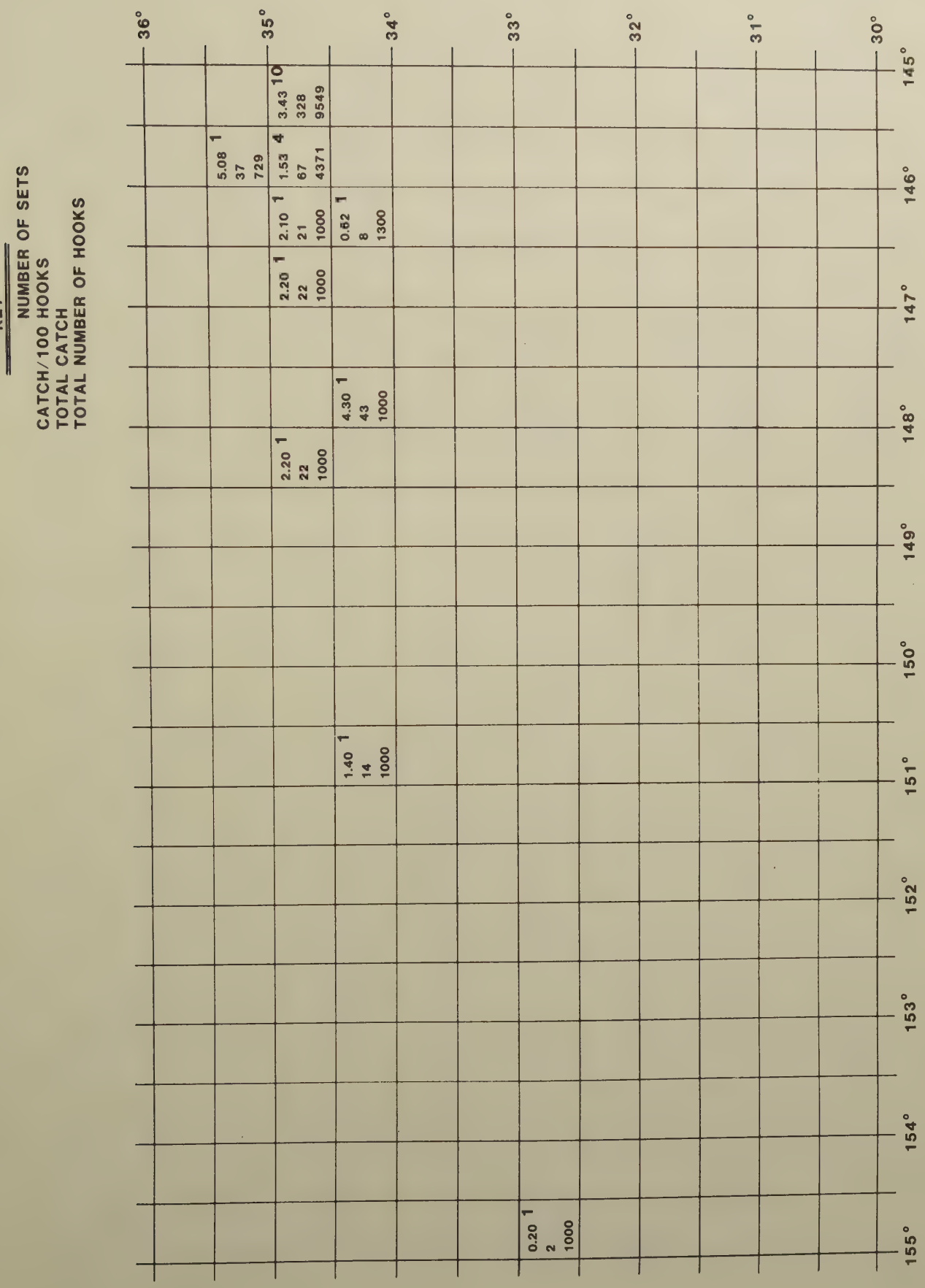

Figure 5b. Summary of catch & effort by 1/2-degree square for all vessels.

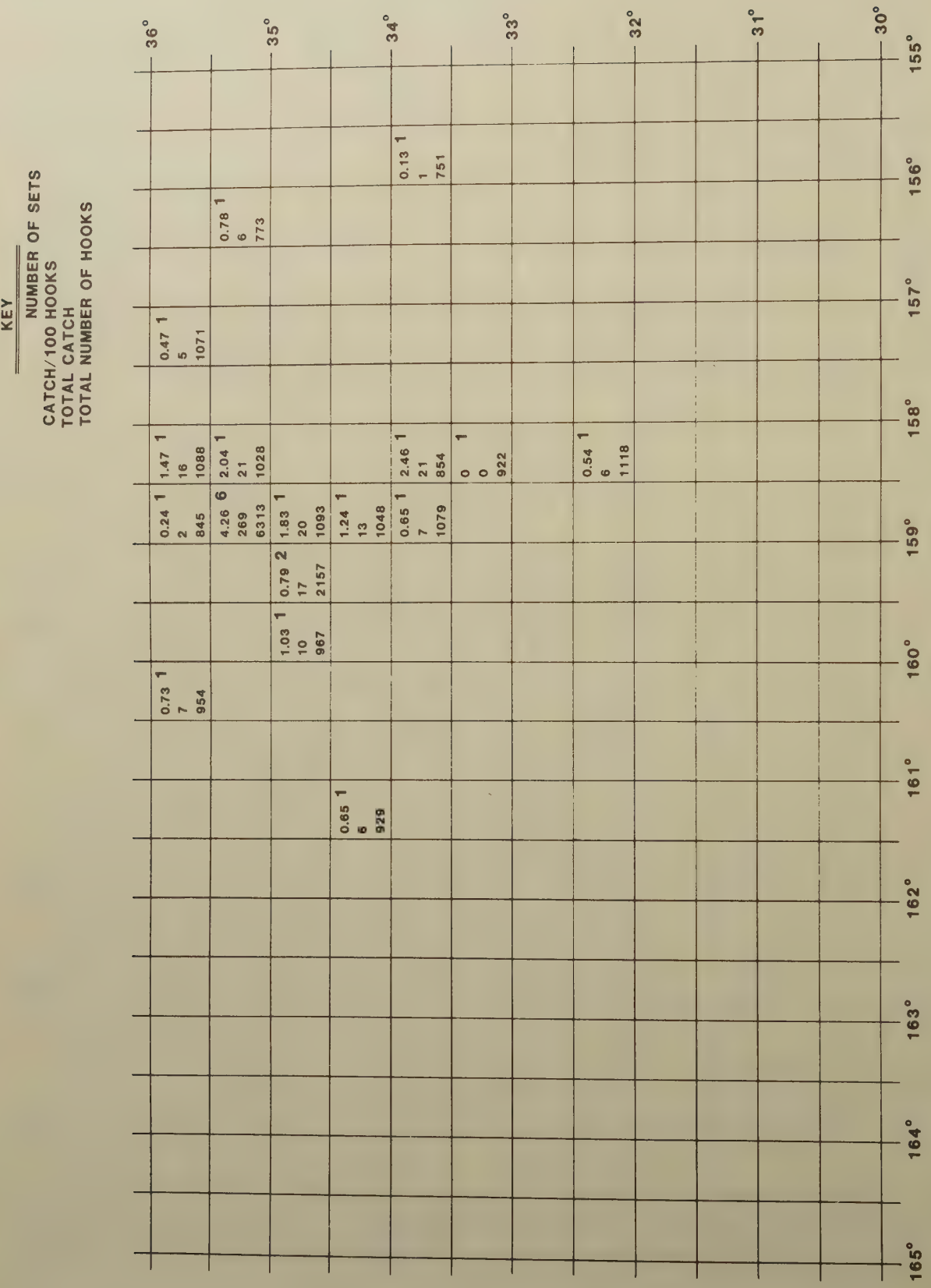

Figure 5c. Summary of catch & effort by 1/2-degree square for all vessels.

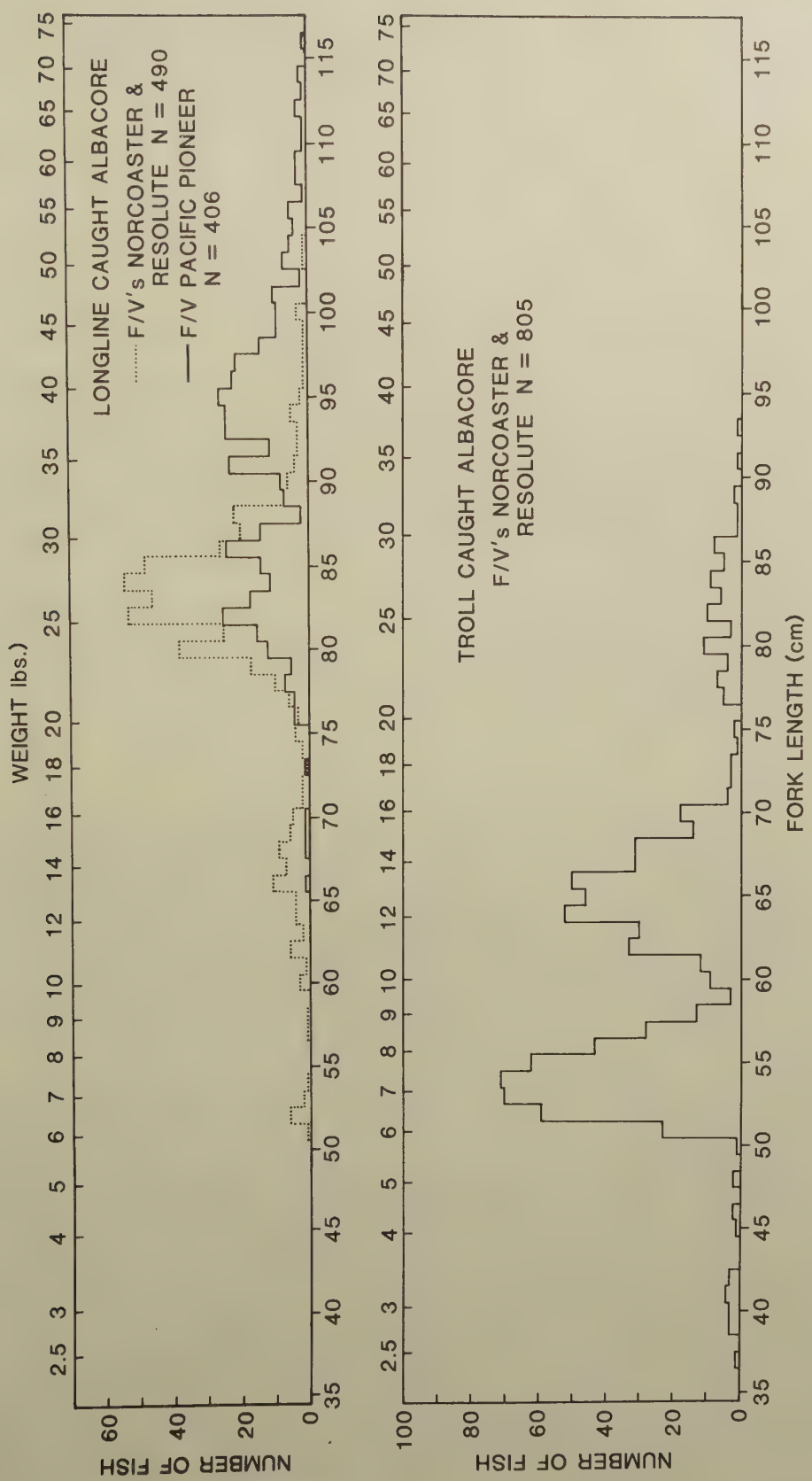

Figure 6. Length frequency of albacore caught by longline (upper) and trolling (lower) on vessels with scientific observers.

150 to 420 feet on 1600 ft. baskets (Figure 7). There were some differences in sag observed with different types of main line, although the limited number of experiments with each type makes comparison difficult. The data from both cruises indicates that the line sag is 10-25 percent of the basket length with an average of approximately 17 percent.

There is ample evidence that albacore spend much of their time in waters associated with the thermocline. During the November-December 1982 longline operations the thermocline depths were between about 200 and 300 feet. Because of the great amount of sag in the main line most of the hooks on a set fished at depths considerably below the thermocline most of the time. We believe this is an important factor which contributed to reduced catch rates generally made by the boats operating on the November-December cruise.

A comparison of buoy line length and percent of catch taken near the buoy and near the center of the basket aboard the Norcoaster is shown in Table 3. With 72 foot buoy line lengths 68% of the catch was taken near the buoy and 32% near the center of the basket. When mixed 72 foot and 18 foot buoy lines were used 60% of the catch was taken near the buoy and 40% near the center. When 18 foot buoy line lengths were used the catch was nearly the same near the center of the basket, 52%, as it was near the buoy, 48%.

It is estimated that with the 72 ft. buoy lines the center of the main line was sagging below the thermocline. By shortening the buoy lines the center of the main line was fishing within or above the thermocline as were the hooks near the buoys (see Figure 3c).

Fish Loss

The amount of fish loss experienced by the Norcoaster, Pacific Pioneer and Resolute can be estimated based on records kept by scientific observers aboard each of the vessels. Along with the fish caught, observations were made on bent, broken and lost hooks; gangions which were twisted or tangled by fish but the fish was lost, and albacore which were lost at the boat. Table 4 summarizes the data on estimated lost fish as a percentage of total tuna caught by set for each of the three vessels which had scientific observers. The estimated fish loss ranged from 11% to 51%.

Bent or lost hooks contributed the highest estimated fish loss on the Resolute (29%) and Norcoaster (25%), but was quite low on the Pacific Pioneer (3%). The most probable cause of hook loss was traced to the use of slightly oversized nicopress sleeves used on the Resolute and Norcoaster to attach hooks to the gangions. Sleeves measuring 3/32-inch I.D. were used on 1/16-inch diameter monofilament. When under heavy strain, e.g., similar to a fish being hooked or struggling vigorously, the monofilament could pull free from the crimped sleeve. On the Norcoaster the only hooks which were bent or straightened were the Mustad No. 7 circle hooks. No hook bending was noted with Mustad No. 4 circle hook or No. 34 Japanese longline hook on the Norcoaster or with No. 34 Japanese longline hook on the Pacific Pioneer.

Tangled gangions caused a greater estimated fish loss on the Resolute (20%) than on the Norcoaster (5%) or Pacific Pioneer (5%). The Resolute used

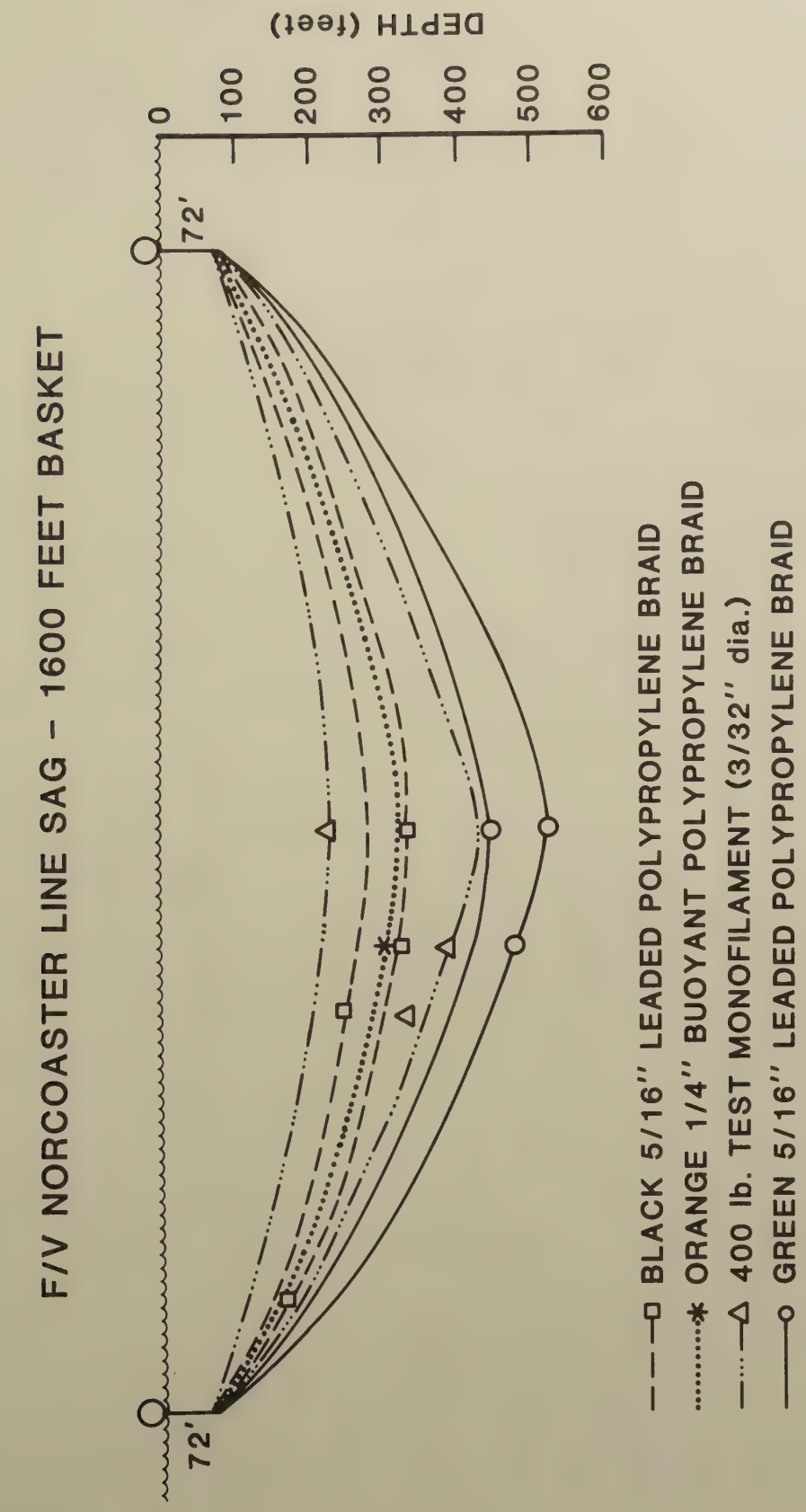

Figure 7. Schematic of the measured sag in the various types of main line used on the F/V Norcoaster.

TABLE 3. A COMPARISON OF THE BUOY LINE LENGTH AND LOCATION OF TUNA CAUGHT ALONG THE MAIN LINE.

BUOY LINE LENGTH	NO. OF SETS	% CATCH NEAR BUOY*	% CATCH AT CENTER BASKET	TOTAL # TUNA
72 FT.	9	68%	32%	79
72 & 18 FT.	3	60%	40%	139
18 FT.	5	48%	52%	129

*WITHIN 25% OF THE BASKET LENGTH FROM BUOY.

TABLE 4. ESTIMATED LOSS OF TUNA (AS A PERCENT OF TOTAL TUNA CAUGHT) AND CAUSAL FACTORS FOR THE THREE VESSELS WITH SCIENTIFIC OBSERVERS.

VESSEL	ALB. LOST AT RAIL	BENT OR LOST HOOK	TANGLED GANGION	TOTAL ESTIMATED FISH LOST
RESOLUTE FIXED GEAR, OVERSIZE SLEEVES USED ON GANGIONS	2%	29%	20%	51%
NORCOASTER SNAP ON GEAR, OVERSIZE SLEEVES USED ON GANGIONS	4%	25%	5%	33%
PACIFIC PIONEER SNAP ON GEAR. THREE BASKETS GEAR PER SPOOL.	3%	3%	5%	11%

fixed gear which is believed to be the cause of the tangling while the other two vessels used snap-on gangions with swivels.

Comparison of Albacore Catch Rates when using Monofilament and Polypropylene Main Lines

Experiments were conducted on the Norcoaster using different types of line for construction of the main line. Results show that the catch rates of albacore were nearly two times higher when using monofilament (4.2 fish per 100 hooks) than when using polypropylene (2.6 fish per 100 hooks) (see Table 5). While additional testing of monofilament for the main line is needed, the findings made on the Norcoaster suggest that monofilament is an excellent main line material. In addition to having higher catch rates, it is easy to handle and is moderate in cost. Abrasion of the monofilament main line was not a problem and splicing was easily accomplished with nicopress sleeves. Life expectancy of monofilament main line is unknown since there may be an increase in brittleness with age.

The reasons for the higher catch rates when using monofilament as opposed to polypropylene are not entirely understood. We believe, however, an important factor is that monofilament is less likely to be visually detected by an albacore than polypropylene or similar material.

COMPARISON WITH JAPANESE HISTORICAL CATCH RATES

The Japanese longline catch rates for albacore derived from data published by the Research Department, Fisheries Agency of Japan have been averaged for January and February of the years 1969 through 1979 (Lynn and Bliss, 1982) and are given in Figures 8a and 8b. The catch rates of the appropriate 5-degree blocks are in the range 0.5 to 2.6 fish/100 hooks for November and 0.3 to 2.6 fish/100 hooks for December. The combined average for the six U.S vessels was 1.5 albacore/100 hooks which is about midpoint of the Japanese historical averages.

The Japanese longline catches show considerable variation among years both in distribution of catches and in catch rates. During the eleven year period, 1969-1979, the highest catch rates made in this region by the Japanese were about 4 fish/100 hooks in 1979.

TABLE 5. COMPARISON OF ALBACORE CATCH RATES MADE WITH POLYPROPYLENE AND MONOFILAMENT MAIN LINE USED ON THE F/V NORCOASTER.

	MONOFILAMENT	POLYPROPYLENE
NO. SETS	17	17
TOTAL NO. HOOKS	2085	9363
AVE. NO. HOOKS/SET	123	551
NO. ALBACORE	87	240
NO. ALB./100 HOOKS	4.17	2.56

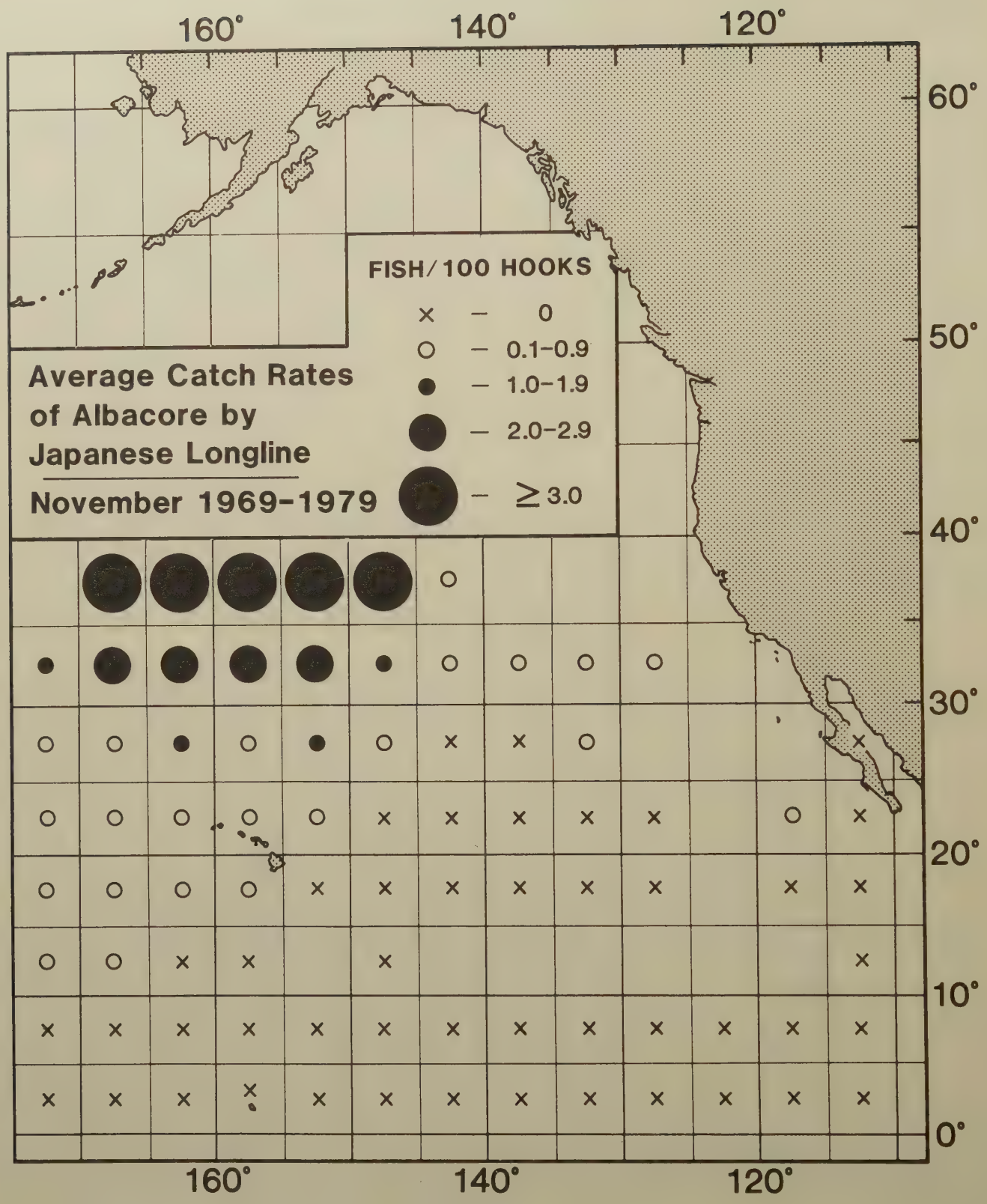

Figure 8a. Standardized catch rates of Japanese longline vessels in November averaged over the years 1969-1979.

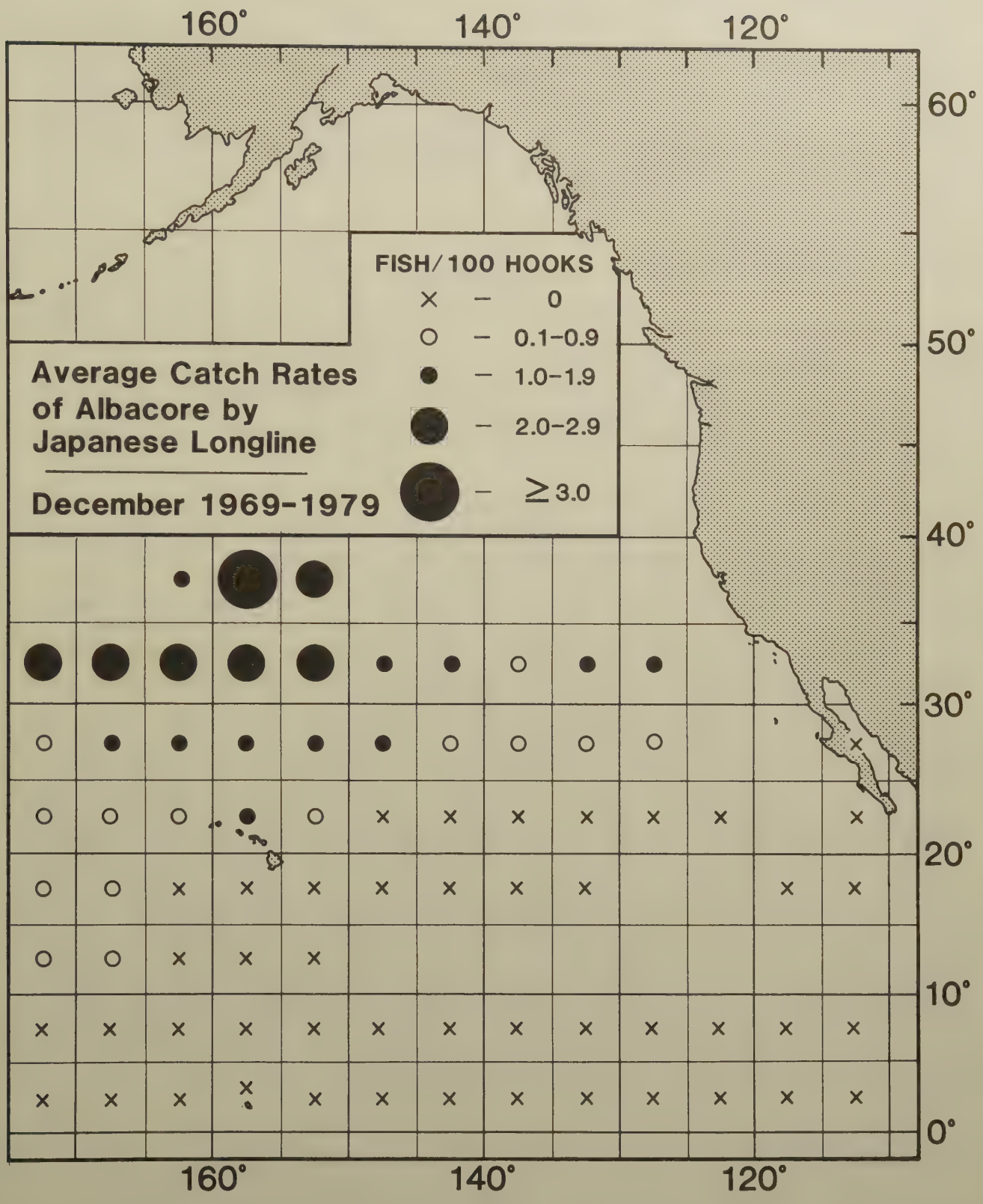

Figure 8b. Standardized catch rates of Japanese longline vessels in December averaged over the years 1969-1979.

ALBACORE CATCHES MADE BY TROLLING

Information on catches of albacore made by trolling is given in Figures 9a and 9b. The area of best troll catches along the cruise track was between about 125° to 135°W. Eastward and westward of these longitudes catches were much lower. The size composition of the troll caught fish is shown in Figure 6a. Troll catches accounted for an estimated 17,000 pounds or about one-third of the total weight of albacore caught during the study.

ALBACORE CATCHES IN RELATION TO OCEAN TEMPERATURE CONDITIONS

For the vessels which concentrated their longline fishing efforts between 33° and 36°N and 135° and 147°W, sea surface temperatures were 63° to 66°F. This is 2 to 3°F below long-term average November temperatures for the area (67 to 68°F). The Arrow spent some effort near 31°N where surface temperatures reached 69°F. The Pacific Pioneer fished between 33°N to 36°N and 155° to 161°W in waters of 64°F to 68°F which did not differ from average November conditions.

In the vertical section of temperature (Figure 10) two thermoclines are evident east of 147°W. The shallower thermocline lies between 200 and 300 feet and roughly follows the 62°F isotherm. The deeper thermocline lies between 400 and 700 feet and follows the 55°F isotherm. This double thermocline is a seasonal development that carries over from summer into early winter. Summer heating of the surface waters creates a very shallow warm mixed layer and accompanying thermocline. In the fall cooling and deep mixing due to the increase in winds and storms gradually deepens the "summer" thermocline. By midwinter it joins the deep thermocline which is residual from the previous winter. The previous longline surveys in January of 1981 and 1982 found only a single deep thermocline which followed the 58° to 60°F isotherms. The best longline catches of albacore appeared to be associated with the single thermocline. The thermal conditions in November 1982 were intermediate between the summer and midwinter conditions. It is reasonable to assume that this double thermocline structure would have a significant influence on the vertical distribution of albacore. The shallower thermocline is the most likely feature to aggregate albacore. It is a more intense temperature gradient and has a temperature range more typical of waters in which albacore are found. Earlier work has shown that albacore move up and down through vertical temperature gradients, probably in a feeding behavior. The combination of light and nutrients are likely to be more favorable in the shallower thermocline for plankton growth which, in turn, would attract marine life forms upon which albacore forage. The depth of the shallow thermocline in November 1982 is much less than the thermocline depth in January of 1981 or 1982 and hence would require much shorter buoy lines.

ALBACORE TAGGING

Only 26 fish were tagged and released during the study--all from the Norcoaster. Fish caught by longline were usually unsuitable for tagging because they were dead or often appeared near death.

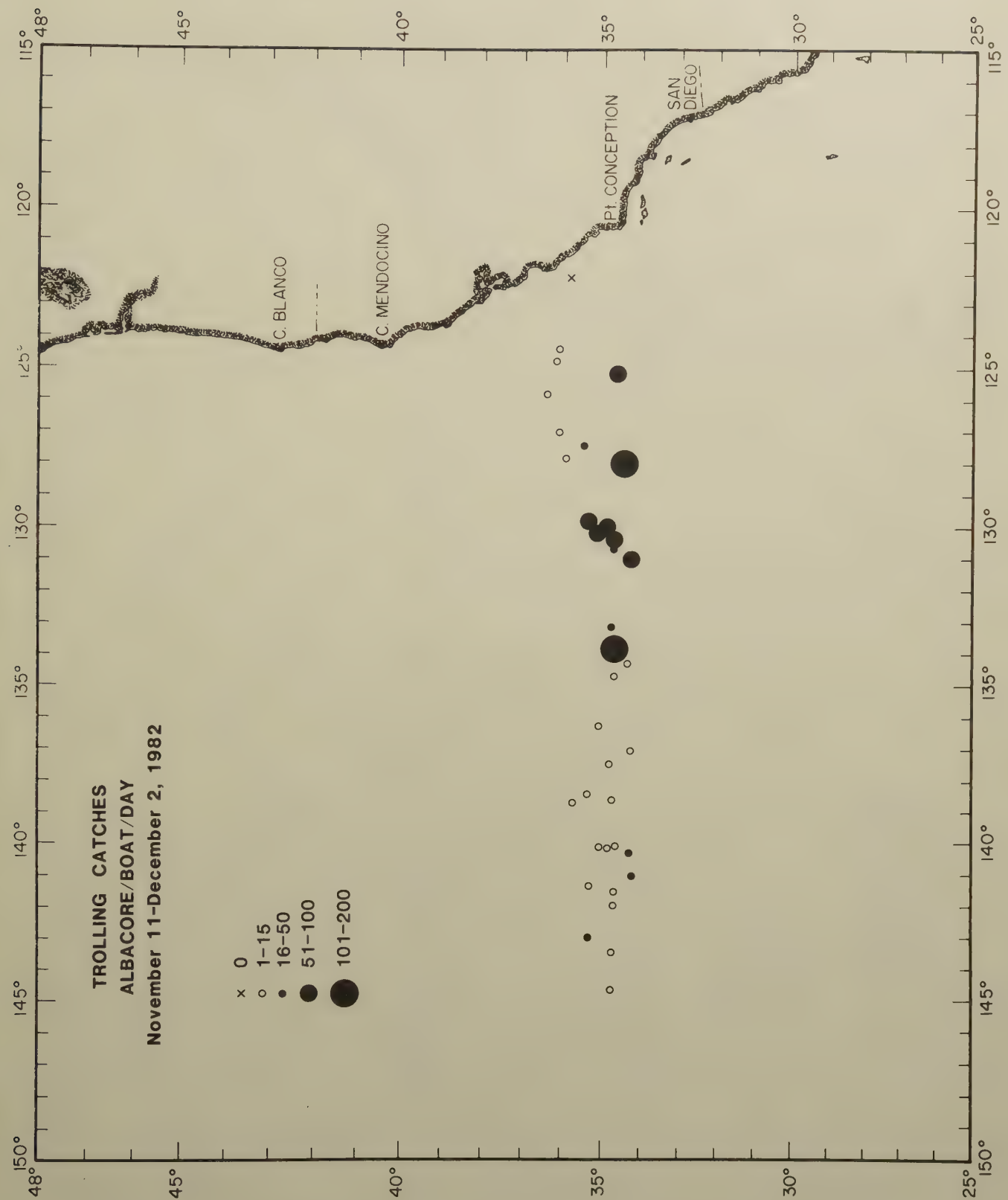

Figure 9a. Daily trolling catches of four of the charter vessels on the outbound leg of the longline cruise.

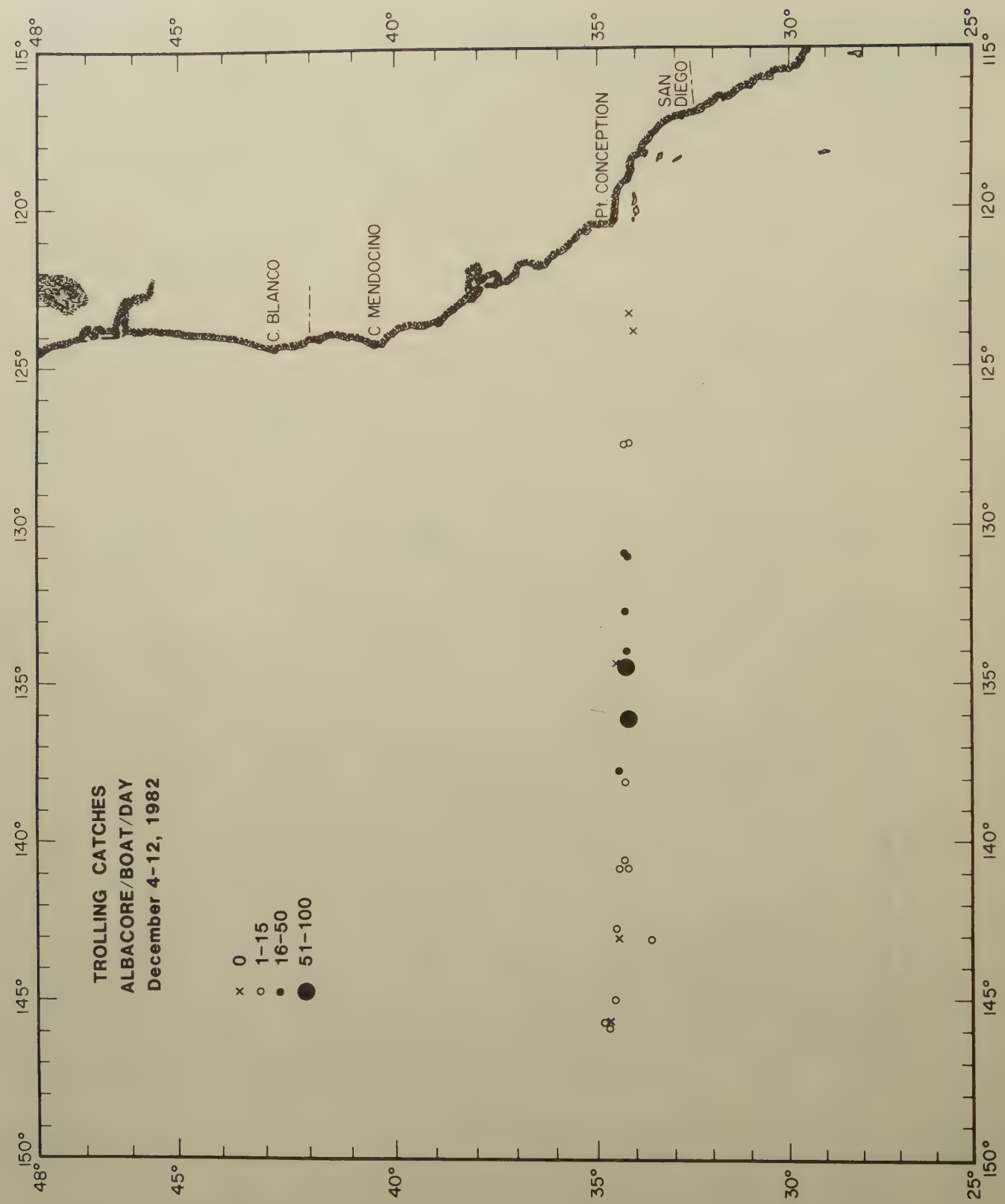

Figure 9b. Daily trolling catches of four of the charter vessels inbound from the longlining area.

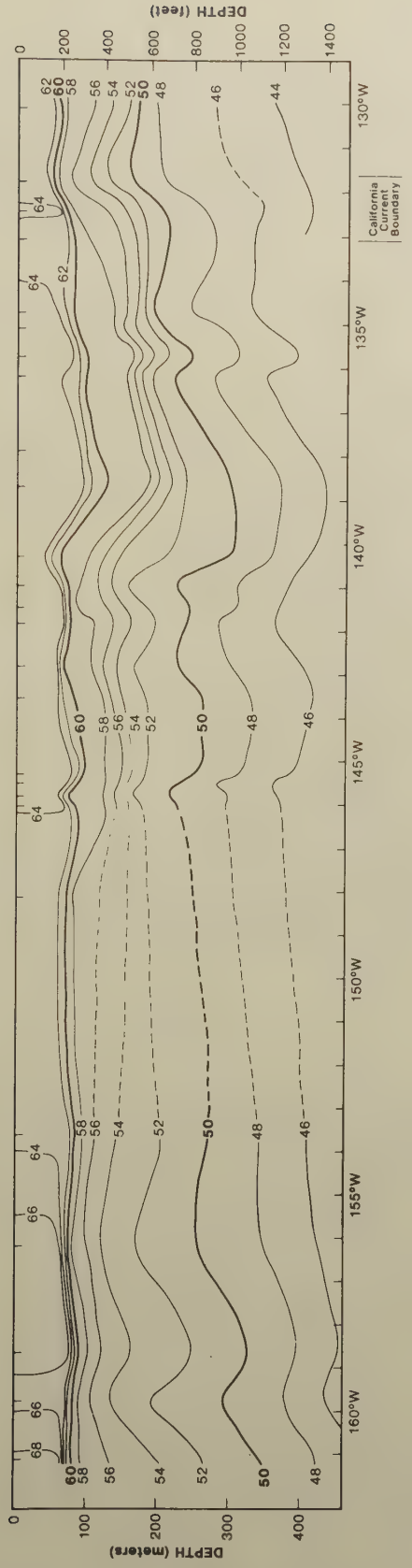

Figure 10. Temperature section along 34°30'N latitude from 125°-165° west longitude as determined by expendable bathythermographs (XBTs) taken by charter vessels on the outbound leg of the charter.

INCIDENTAL FISH CAUGHT BY LONGLINE

In addition to albacore, bigeye and yellowfin tunas there were 11 species of fish caught by longline. Albacore and skipjack tunas and 4 other species of fish were caught trolling. The species and numbers caught are summarized by gear type in Table 6; also, see Appendix 1.

Table 6. List of Species of Fish Caught by Longline and Trolling.

Common Name	Scientific Name	Number Caught Longline	Trolling
Albacore	Thunnus alalunga	1314	1633
Bigeye tuna	Thunnus obesus	54	0
Yellowfin tuna	Thunnus albacares	31	0
Skipjack tuna	Katsuwonus pelamis	0	8
Mahimahi	Coryphaena hippurus	162	50
Longnose lancetfish	Alepisaurus ferox	127	0
Wahoo	Acanthocybrium solandri	46	0
Pelagic stingray	Dasyatis violacea	37	0
Blue shark	Prionace glauca	21	0
Yellowtail	Seriola dorsalis	3	2
Opah	Lampris regius	5	0
Swordfish	Xiphias gladius	5	0
Mako shark	Isurus oxyrinchus	2	0
Pacific pomfret	Brama japonica	1	0
Escolar	Lepidocybrium flavobrunneum	1	0
Blue marlin	Makaira nigricans	0	1
Shortbilled spearfish	Tetrapturus angustirostris	0	2

WEATHER

Inclement weather conditions drastically reduced effective fishing effort. During the survey the winds were in excess of 20 knots for 53% of the days the vessels operated on fishing grounds (see Table 7). On a number of days the winds exceeded 45-50 knots. Most of the rough seas and high winds were associated with hurricane Ewa, the first hurricane to hit the Hawaiian Islands since the early 1950's. The path followed by Ewa passed over the area where the exploratory albacore longline operations were planned. This prevented vessels from operating in the planned area except for seven days. During the limited days that the boats were able to operate in the targeted area catch rates averaged over 4 albacore/100 hooks as opposed to about 1 albacore/100 hooks on other days. The rough weather conditions also limited the amount of gear that the fishermen could fish. In addition adverse weather conditions precluded acoustic tracking experiments by NMFS scientists to investigate the swimming depths and ocean temperature relationships of albacore during the longline survey.

Table 7. Summary of Wind Conditions Observed During Albacore Longline Survey, November-December 1982.

Wind (Knots)*	Days on Fishing Grounds	All Days Including Transit Time
<10	9%	30%
10-19	38%	25%
20-30	31%	35%
>30	22%	10%

*Based on weather observations made at approximately 0900 each morning. Winds in afternoons often increased 10-20 knots above those recorded at 0900.

FUEL CONSUMPTION

A very important finding resulting from the project is that the longline fishing operations are considerably more economical in daily fuel usage than are trolling methods used in the normal U.S albacore fishery. While there was variability in fuel consumption among the vessels, generally, daily fuel consumption in longlining was only 50 to 60 percent of the daily fuel consumption in trolling. Also the transit distance to and from the general longline fishing area is about the same or somewhat less than that which trollers travel along the coast during the traditional U.S. fishery. For example a boat off southern California must travel 1200 miles when fishing is centered off central Oregon and about 1800 miles when fishing is off Vancouver Island, B.C.

CONCLUSIONS

The surveys conducted during this study show that the U.S. albacore fishery can be extended to operate during winter months using longline fishing operations in an area where the fleet has not traditionally fished. It is anticipated that with gear modifications and careful selection and handling of bait that the overall catch rates can be significantly increased. Based on the experiences gained from this project, modification to systems and operations should allow a vessel to fish 2000 hooks per set. Because fuel consumption is much less than for standard trolling operations, more time can be spent on the longline grounds than is usual for a trolling trip.

More exploratory work is needed to examine the effect of seamounts and undersea ridges on fishing success. Also, more knowledge is needed on the distribution of catches over the fall and winter seasons and their association with the seasonally changing oceanographic conditions. In addition, further work is needed to better understand sag in the main line and additional testing of monofilament for constructing the main line. Very importantly, an economic analysis is needed to explore the cost factors and expected benefits of longline operations. Such a study would provide a basis for choosing between longline operations or some alternate use of an albacore vessel.

RECOMMENDATIONS

The recommendations arising from the three surveys fall into two categories: 1) those that are believed to be necessary for successful longline fishing operations for albacore during winter months, and 2) those that are believed to be important, but require further experience or experimentation to validate.

Those in the first category include:

1. Use Omega navigation system. LORAN coverage is unsatisfactory in the offshore region. Satellite navigation is only marginally useful because there are often long times between satellite passes (sometimes 4 to 12 hours). Accuarate positioning is particularly important when releasing the first and last floats of a set in order to avoid losing time in relocating them.

2. Baiting as gear is set is desirable. However, it may be satisfactory to bait with partially thawed bait while hauling providing the baited hooks are kept under refrigeration until the next set.

3. Use only fresh bait that are in good condition.

4. Use a crew of 3 or 4 depending upon operational requirements of vessel.

5. Use expendable bathythermograph (XBT) or other instrumentation for measuring vertical temperature profiles.

6. Use techniques to avoid loss of fish due to twisting of gangion and main line including: splicing swivels in gangion, adjusting snaps to fit loosely on main line in combination with stops or swivels in main line, maintaining minimum tension on main line during retrieval, use braided rather than twisted main line.

7. Use powered puller for retrieving buoy line.

8. Provide effective means for locating gear by use of a combination of equipment such as radio transmitters/RDF system, radar reflectors, Xenon or similar lights, flags placed at every 5 to 8 buoys.

9. Bring rubber gloves for use when baiting with squid.

10. Bring several long handled gaffs.

11. Ensure adequate floatation for supporting buoy lines by using at least 14 inch diameter, or larger, buoys with a highly visible color.

12. Begin haul from first end set to equalize soak time.

13. Begin sets after first light to reduce bait loss, presumably to squid.

14. Use heavy duty longline reel to withstand the strain of hauling line.

15. If monofilament main line is used a removable spool system reduces hauler size and aids storage.

16. Use buoys about every 900 feet to reduce sag in main line. Also, buoy action may increase catch. Those in the second category include:

1. Use chromascope for locating fish.

2. Use five-foot to six-foot gangions constructed with 200 to 250 pound test monofilament.

3. Some fishermen feel that circle hooks are more effective for catching tuna than other types of hooks.

4. Opinions vary on the size and strength of hook. Larger, stronger hooks may hold large albacore and bigeye tuna; whereas, smaller, lighter hooks may allow sharks to break away and thus minimize damage to gear.

5. Although not necessary, throttle and steerage controls on working deck ease fishing operations considerably.

ACKNOWLEDGEMENTS

The successful completion of a project of this magnitude requires helpful input from many people. We express our appreciation to Bob Nishimoto, Dimitry Abramenkoff and Ron Dotson as scientific observers aboard the vessels and for their excellent job. We also thank the staff of the Western Fishboat Owner's Association and the board of the American Fishermen's Research Foundation whose interest and cooperation in scientific inquiry into albacore research were fundamental to this project. We also thank Ron Lynn, Gary Hunt and Bob Nishimoto for assisting in data analysis, Julie Shoemaker for the typing, and Howard Ness and his staff at the Southwest Regional Office for their assistance in administering the grant.

Special thanks goes to the Captains (Byron, Dave, Dixie, Elwin and Palmer) and crews of the five fishing vessels whose devotion to their profession and rugged individualism provided the backbone of this operation.

APPENDIX 1

NOVEMBER 12

	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	No Set Trolling	No Set Trolling	1	1	No Set Trolling
Time and Start Set Position: End Set	25°10'N 160°50'W 26°30'N 161°00'W	35°59'N 126°31'W 36°05'N 127°48'W	1025 35°59.9'N 127°59.0'W 1046 36°01.1'N 127°57.3'W	0715 35°36'N 127°14'W 0745 35°35'N 127°11'W	34°28'N 122°55'W 34°35'N 124°56'W
Course of Set			025°	090°	
Time and Start Haul Position: End Haul			1255 36°01.1'N 127°57.3'W 1440 36°00.0'N 127°57.0'W	1030 35°36'N 127°14'W 1220 35°35'N 127°11'W	
First Float Hauled:			Last Set	First Set	
Total No. Hooks	8 Lines	8 Lines	290 (includes 123 art. bait)	370	10 Lines
Type of Hook			#7 M. Circle	#7 M. Circle	
No. of Baskets			7	8	
Buoy Line Lengths			150 ft.	125 ft.	
Sea Surface Temp.	76°F	61°F	62.5°F	63°F	63°F
Mixed Layer Depth	260 ft.	180 ft.	160 ft.	NR	210 ft.
Wind: Speed Direction	15 kts. 270°	15-18 kts. 250°	12-15 kts. 150°	5-10 kts. 135°	No Wind
Sea/Swell: Height Direction	3 ft. 270°	3 ft. 225°	6 ft. 140°	2-4 ft. 270°	1 ft. 310°
Catch: Albacore	Ø	7	1 L.L. (6 trolling)	2 L.L. (36 trolling)	56
Alb. Catch Rate (per 100 Hooks)			0.34	0.54	
Catch: Bigeye			Ø	Ø	
Catch: Sharks			2 Blue	1 Blue	
Catch: Other	2 Mahi-Mahi		Ø	Ø	
Lost/Broken Hooks			4	NR	
Twisted Gangion			Ø	NR	
Alb. Lost at Surface			Ø	NR	

JLL = Japanese Longline M. Circle = Mustad Circle J. Circle = Japanese Circle NR = No Record

NOVEMBER 13

	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	No Set Trolling	No Set Trolling	No Set Trolling	No Set Trolling	No Set Trolling
Time and Position: Start Set	27°57'N 160°00'W	35.36.1'N 129°38.4'W	35°27'W 130°10'W	35°00'N 129°50'W	34°30'N 127°30'W
End Set	29°30'N 160°53'W	35°03.0'N 130°06.0'W	34°55'N 130°08.0'W	34°58'N 130°02'W	34°25'N 128°40'W
Course of Set					
Time and Position: Start Haul					
End Haul					
First Float Hauled:					
Total No. Hooks	8 Lines	7 Lines	10 Lines	10 Lines	10 Lines
Type of Hook					
No. of Baskets					
Buoy Line Lengths					
Sea Surface Temp.	72°F	61°F	61.5°F	63°F	64°F
Mixed Layer Depth	185 ft.	170 ft.	220 ft.	NR	170 ft.
Wind: Speed	10 kts.	20 kts.	25 kts.	15 kts.	10-15 kts.
Direction	030°	120°	130°	135°	110°
Sea/Swell: Height	3 ft.	4 ft.	8-10 ft.	3-4 ft.	4 ft.
Direction	180°	130°	150°	250°	090°
Catch: Albacore	Ø	80	102	226	112
Alb. Catch Rate (per 100 Hooks)					
Catch: Bigeye					
Catch: Sharks					
Catch: Other	3 Mahi-Mahi		2 Mahi-Mahi		
Lost/Broken Hooks					
Twisted Gangion					
Alb. Lost at Surface					

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	No Set Trolling	No Set Trolling	2	2	No Set Trolling
Time and Start Set Position:	31°14'N 160°56'W	34°54.5'N 131°49.1'W	0705 34°54.4'N 130°12.7'W	0715 34°49'N 130°12'W	34°16'N 130°39'W
End Set	32°40'N 161°00'W	34°45.7'N 133°03.6'W	0734 34°57.3'N 130°13.7'W	0800 34°48'N 130°08'W	34°21'N 131°45'W
Course of Set			335°	080°	
Time and Start Haul Position:			0957 34°58.4'N 130°13.5W	1030 34°49'N 130°12'W	
End Haul			1245 34°56.4'N 130°13.1'W	1230 34°49'N 130°10'W	
First Float Hauled:			Last Set	First Set	
Total No. Hooks	8 Lines	8 Lines	421 (includes 123 art. bait)	442	11 Lines
Type of Hook			#7 M. Circle	#7 M. Circle	
No. of Baskets			10	9	
Buoy Line Lengths			150 ft.	150 ft.	
Sea Surface Temp.	71°F	63°F	63°F	63°F	64°F
Mixed Layer Depth	210 ft.	170 ft.	170 ft.	NR	230 ft.
Wind: Speed Direction	5 kts. 160°	20 kts. 140°	20-25 kts. 130°	20 kts. 110°	15-20 kts. 100°
Sea/Swell: Height Direction	12 ft. 270°	5 ft. 120°	6 ft. 100°	4 ft. 180°	4 ft. 090°
Catch: Albacore	Ø	113	8 L.L. (47 trolling)	18 L.L. (43 trolling)	89
Alb. Catch Rate (per 100 Hooks)			1.90	4.07	
Catch: Bigeye			Ø	Ø	
Catch: Sharks			Ø	Ø	
Catch: Other	6 Mahi-Mahi 1 Skipjack	3 Mahi-Mahi	Ø	1 Mahi-Mahi	
Lost/Broken Hooks			10	NR	
Twisted Gangion			1	NR	
Alb. Lost at Surface			Ø	NR	

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	1	1	No Set Trolling	No Set Trolling	No Set Trolling
Time and Start Set Position:	0833 34°16'N 161°05'W	0923 34°43.6'N 135°00.9'W	34°43'W 132°25'W	34°22'N 132°38'W	34°20'N 134°39'W
End Set	1017 34°30'N 161°08'W	1007 34°42.1'N 135°05.5'W	34°52'N 134°05'W	34°18'N 134°12'W	34°12'N 135°00'W
Course of Set	340°	244°			
Time and Start Haul Position:	1445 34°30'N 161°08'W	1330 34°40.7'N 135°04.1'W			
End Haul	1920 34°16'N 161°05'W	1645 34°41.9'N 135°03.3'W			
First Float Hauled:	Last Set	Last Set			
Total No. Hooks	929	313 (includes 25 art. bait)	10 Lines	10 Lines	11 Lines
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle	#7, #4 M. Circle, #34 JLL			
No. of Baskets	23	13			
Buoy Line Lengths	200, 300 ft.	150 ft.			
Sea Surface Temp.	68°F	64.5°F	63°F	64°F	65°F
Mixed Layer Depth	200, 210, 240 ft.	180 ft.	210 ft.	NR	190 ft.
Wind: Speed	15 kts.	5-10 kts.	5-10 kts.	5 kts.	10-15 kts.
Direction	240°	330°	290°	000°	060°
Sea/Swell: Height	3 ft.	3 ft.	4 ft.	4 ft.	3 ft.
Direction	240°	010°	100°	110°	060°
Catch: Albacore	6	3 LL (1 trolling)	17	4	Ø
Alb. Catch Rate (per 100 Hooks)	0.65	1.28			
Catch: Bigeye	Ø	Ø			
Catch: Sharks	Ø	Ø			
Catch: Other	2 Mahi-Mahi 1 Wahoo 4 Alepisaurus	1 Mahi-Mahi 1 S.B. Spearfish (trolling)			2 Mahi-Mahi 1 S.B. Spearfish
Lost/Broken Hooks	2	Ø			
Twisted Gangion	Ø	Ø			
Alb. Lost at Surface	1	1			

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	2	No Set Trolling	No Set Trolling	No Set Trolling	1
Time and Start Set Position:	0835 35°50'N 160°32'W	34°20'N 137°08'W	34°58.2'N 135°44.4'W	34°20'N 135°52'W	0900 34°25'N 136°45'W
End Set	1031 36°03'N 160°22'W	35°05'N 137°50'W	35°10.0'N 136°57.0'W	34°21'N 137°21'W	1100 34°45'N 136°28'W
Course of Set	045°				260°
Time and Start Haul Position:	1430 36°03'N 160°22'W				1300 34°25'N 136°45'W
End Haul	1915 35°50'N 160°32'W				2015 34°45'N 136°28'W
First Float Hauled:	Last Set				First Set
Total No. Hooks	954	7 Lines	10 Lines	10 Lines	1,000
Type of Hook	#8 M. Circle, #34 LL, #30 J. Circle				#5 M. Circle
No. of Baskets	21				32
Buoy Line Lengths	100, 200 ft.				300 ft.
Sea Surface Temp.	65°F	66°F	64°F	64°F	NR
Mixed Layer Depth	210, 230 ft.	220 ft.	220 ft.	NR	140 ft.
Wind: Speed Direction	10-15 kts. 230°	10 kts. 280°	10-15 kts. 270°	10 kts. 270°	10 kts. 270°
Sea/Swell: Height Direction	5 ft. 230°	3 ft. 260°	4 ft. 280°	2-3 ft. 270°	2 ft. 270°
Catch: Albacore	7	10	7	6	2
Alb. Catch Rate (per 100 Hooks)	0.73				0.20
Catch: Bigeye	Ø				Ø
Catch: Sharks	2 Blue, 1 Mako				1 Blue
Catch: Other	1 Opah 3 Alep	1 Mahi-Mahi	1 Mahi-Mahi		1 Swordfish
Lost/Broken Hooks	1				NR
Twisted Gangion	Ø				NR
Alb. Lost at Surface	Ø				NR

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	3	No Set Trolling	No Set Trolling	No Set Trolling	No Set Trolling
Time and Start Set Position: End Set	0858 35°36'N 158°15'W 1049 35°35'N 158°45'W	35°38'N 138°27'W	35°27.5'N 137°54.8'W	34°42'N 138°16'W	33°23'N 136°54'W 34°40'N 139°07'W	32°50'N 136°47'W
Course of Set	270°				
Time and Start Haul Position: End Haul	1430 35°35'N 158°45'W 1930 35°36'N 158°15'W				
First Float Hauled:	Last Set				
Total No. Hooks	1,088	6 Lines	10 Lines	10 Lines	10 Lines
Type of Hook	#8 M. Circle, #34 LL, #30 J. Circle				
No. of Baskets	19				
Buoy Line Lengths	200, 300 ft.				
Sea Surface Temp.	66°F	64.5°F	64°F	66°F	65°F
Mixed Layer Depth	210, 270 ft.	190 ft.	240 ft.	NR	200 ft.
Wind: Speed Direction	15 kts. 180°	25-30 kts. 210°	25 kts. 240°	20-25 kts. 250°	10 kts. 220°
Sea/Swell: Height Direction	4 ft. 180°	6 ft. 230°	8-10 ft. 250°	6-8 ft. 270°	3 ft. 220°
Catch: Albacore	15	2	10	7	4
Alb. Catch Rate (per 100 Hooks)	1.38				
Catch: Bigeye	Ø				
Catch: Sharks	1 Blue				
Catch: Other	1 Yellowfin 1 Opah, 2 Alep 1 Mahi-Mahi	1 Mahi-Mahi	2 Mahi-Mahi		
Lost/Broken Hooks	1				
Twisted Gangion	1				
Alb. Lost at Surface	Ø				

LL - Japanese Longline M. Circle = Mustad Circle J. Circle = Japanese Circle NR = No Record

	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	No Set Rough Weather	No Set Trolling	No Set Trolling	3	No Set Trolling
Time and Start Set Position:	35°55'N 157°40'W	35°20'N 140°01.0'W	35°20'N 139°41'W	1100 34°25'N 140°21'W	32°26'N 136°42'W
End Set		34°45.0'N 140°19.9'W	34°31.5'N 140°28.7'W	1125 34°23'N 140°17'W	32°03'N 137°25'W
Course of Set				135°	
Time and Start Haul Position:				1530 34°23'N 140°17'W	
End Haul				1700 34°24'N 140°21'W	
First Float Hauled:				Last Set	
Total No. Hooks		6 Lines	5 Lines	272	10 Lines
Type of Hook				#7 M. Circle	
No. of Baskets				7	
Buoy Line Lengths				150 ft.	
Sea Surface Temp.	65°F	63.5°F	63°F	64.5°F	67°F
Mixed Layer Depth	NR	180, 140 ft.	200 ft.	NR	190 ft.
Wind: Speed Direction	45 kts. 045°	30 kts. 270°	25-30 kts. 290°	25 kts. 315°	30-35 kts. 290°
Sea/Swell: Height Direction	15 ft. 045°	6 ft. 260°	10-12 ft. 310°	10-12 ft. 270°	10 ft. 270°
Catch: Albacore		1	3	2 LL (5 trolling)	Ø
Alb. Catch Rate (per 100 Hooks)				0.74	
Catch: Bigeye				Ø	
Catch: Sharks				Ø	
Catch: Other				Ø	
Lost/Broken Hooks				NR	
Twisted Cangion				NR	
Alb. Lost at Surface				NR	

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	4	2	3	4	2
Time and Start Set	0911	0830	0735	1000	0800
Position:	35°43'N 157°09'W	34°26.0'N 140°39.1'W	34°16.4'N 140°35.0'W	33°15'N 140°25'W	31°51'N 138°25'W
End Set	1115	1000	0835	1100	0924
	35°48'N 156°57'W	34°26.0'N 140°29.0'W	34°11.1'N 140°35.6'W	33°19'N 140°39'W	31°26'N 138°02'W
Course of Set	045°	095°	165°	315°	085°
Time and Start Haul	1510	1245	1100	1630	1300
Position:	35°45'N 156°57'W	34°31'N 140°21'W	34°09.8'N 140°33.9'W	33°19'N 140°39'W	31°51'N 138°25'W
End Haul	2030	1830	1837	1945	2030
	NR	34°30'N 140°32'W	34°14.0'N 140°35.0'W	33°14'N 140°25'W	31°26'N 138°02'W
First Float Hauled:	Last Set	Last Set	Last Set	Last Set	First Set
Total No. Hooks	1,071	695 (includes 28 art. bait)	1,002 (includes 284 art. bait)	711	900
Type of Hook	#8 M. Circle, #34 LL, #30 J. Circle	#7,4 M. Circle; #34 JLL	#7 M. Circle, #9 M.B.C.	#7 M. Circle	#5 M. Circle
No. of Baskets	21	28	24	17	18
Buoy Line Lengths	200, 300 ft.	72 ft.	150 ft.	150, 300 ft. (3)	
Sea Surface Temp.	66°F	65°F	65°F	65.5°F	67°F
Mixed Layer Depth	240 ft.	170, 150 ft.	200 ft.	NR	270 ft.
Wind: Speed	10 kts.	15 kts.	5 kts.	5 kts.	10 kts.
Direction	270°	140°	210°	115°	100°
Sea/Swell: Height	12 ft.	5 ft.	6 ft.	4-6 ft.	8 ft.
Direction	270°	130°	300°	315°	300°
Catch: Albacore	5	11	1	4	Ø
Alb. Catch Rate (per 100 Hooks)	0.47	1.58	0.10	0.56	Ø
Catch: Bigeye	Ø	Ø	Ø	Ø	6
Catch: Sharks	Ø	Ø	Ø	Ø	Ø
Catch: Other	4 Mahi-Mahi 4 Alep.	5 Alep. 1 Wahoo 1 Pelagic Ray	1 Alep. 1 Pelagic Ray	1 Swordfish	Ø
Lost/Broken Hooks	4	7	1	NR	NR
Twisted Gangion	2	Ø	Ø	NR	NR
Alb. Lost at Surface	Ø	Ø	Ø	NR	NR

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	5	3	4	5	3
Time and Start Set	0855	0840	0757	0815	0800
Position:	35°01'N 156°11'W	34°46.7'N 140°56.0W	34°11.8'N 140°53.2'W	33°30'N 140°30'N	30°58'N 137°56'W
End Set	1032	0940	0843	0900	1030
	35°02'N 156°02'W	34°52.6'N 140°56.3'W	34°15.0'N 140°54.0'W	33°32'N 140°29'W	30°51'N 137°59'W
Course of Set	090°	320°	335°	340°	180°
Time and Start Haul	1425	1230	1100	1400	1330
Position:	35°02'N 156°02'W	34°52.9'N 140°56.3'W	34°15'N 140°54'W	33°32'N 140°27'W	30°58'N 137°56'W
End Haul	1830	1630	1632	1630	2130
	35°01'N 156°11'W	34°48.6'N 140°55.5'W	34°09.9'N 140°56.2'W	33°30'N 140°27'W	30°51'N 137°59'W
First Float Hauled:	Last Set	Last Set	Last Set	Last Set	First Set
Total No. Hooks	773	576 (includes 5 art. bait)	669 (includes 250 art. bait)	544	1,200
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle	#4,7 M. Circle; #34 JLL	#7 M. Circle, #9 M.B.C.	#7 M. Circle	#5 M. Circle
No. of Baskets	15	23	16	12	29
Buoy Line Lengths	100, 300 ft.	72 ft.	75, 150 ft.	75, 150 ft.	210, 300 ft.
Sea Surface Temp.	66.5°F	65°F	65°F	67°F	68°F
Mixed Layer Depth	210 ft.	200 ft.	200 ft.	NR	200 ft.
Wind: Speed	15 kts.	25-35 kts.	25-30 kts.	25-30 kts.	15 kts.
Direction	270°	180°	180°	160°	180°
Sea/Swell: Height	10 ft.	8 ft.	12-15 ft.	10-14 ft.	3 ft.
Direction	270°	180°	160°	135°	180°
Catch: Albacore	4	5	1	Ø	Ø
Alb. Catch Rate (per 100 Hooks)	0.52	0.87	0.15	Ø	Ø
Catch: Bigeye	2	1	Ø	Ø	Ø
Catch: Sharks	Ø	Ø	Ø	Ø	Ø
Catch: Other	3 Mahi-Mahi 3 Alep.	2 Mahi-Mahi	1 Alep.	Ø	18 Wahoo 6 Yellowfin 2 Bigeye
Lost/Broken Hooks	Ø	5	Ø	NR	NR
Twisted Gangion	Ø	Ø	Ø	NR	NR
Alb. Lost at Surface	Ø	Ø	Ø	NR	NR

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	6	4	5	6	No Set Trolling
Time and Start Set	0839	0820	0750	0815	
Position:	33°35'N 156°05'W	34°46.6'N 141°26.3'W	34°12.6'N 141°21.8'W	33°30'N 141°21'W	30°59'N 138°29'W
End Set	1010	0950	0903	0945	
	33°41'N 155°54'W	34°47.9'N 141°13.4'W	34°12'N 141°27'W	33°29'N 141°08'W	30°50'N 138°50'W
Course of Set	045°	070°	260°	090°	
Time and Start Haul	1430	1300	1108	1245	
Position:	33°41'N 155°54'W	34°47.6'N 141.13.7'W	34°10.2'N 141°22.9'W	33°29'N 141°06'W	
End Haul	1930	1713	1913	1800	
	33°35'N 156°05'W	34°47.2'N 141°21.1'W	34°14.0'N 141°29.4'W	33°27'N 141°'21'W	
First Float Hauled:	Last Set	Last Set	First Set	Last Set	
Total No. Hooks	751	661 (includes 23 art. bait)	1,051 (includes 41 art. bait)	1,028	10 Lines
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle	#7,4 M. Circle; #34 JLL	#7 M. Circle, #9 M.B.C.	#7 M. Circle	
No. of Baskets	14	28	25	23	
Buoy Line Lengths	200, 400 ft.	42, 72 ft.	75, 150 ft.	75, 150 ft.	
Sea Surface Temp.	68°F	65.5°F	65°F	65°F	68°F
Mixed Layer Depth	190 ft.	190 ft.	180 ft.	NR	260 ft.
Wind: Speed	10 kts.	10 kts.	5-10 kts.	3-5 kts.	20-25 kts.
Direction	290°	270°	250°	270°	225°
Sea/Swell: Height	8 ft.	6 ft.	4-6 ft.	6 ft.	6 ft.
Direction	290°	240°	230°	225°	225°
Catch: Albacore	1	Ø	Ø	2	Ø
Alb. Catch Rate (per 100 Hooks)	0.13	Ø	Ø	0.19	
Catch: Bigeye	Ø	Ø	Ø	2	
Catch: Sharks	Ø	Ø	Ø	Ø	
Catch: Other	2 Wahoo	1 Opah 2 Alep. 2 Pelagic Rays	2 Mahi-Mahi 1 Swordfish	Ø	
Lost/Broken Hooks	Ø	Ø	4	4	
Twisted Gangion	Ø	Ø	2	NR	
Alb. Lost at Surface	Ø	Ø	Ø	NR	

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	No Set Trolling	5	6	7	4
Time and Start Set Position:	33°56'N 157°08'W	0758 35°01.2'N 141°47.0'W	0753 33°00.4'N 142°03.9'W	0800 33°28'N 141°48'W	0800 30°55'N 139°13'W
End Set	34°56'N 157°54'W	0915 34°55.6'N 141°34.4'W	0858 32°48.0'N 141°59.0'W	0940 33°25'N 141°41'W	0930 30°57'N 139°26'W
Course of Set		090°	165°	135°	290°
Time and Start Haul Position:		1250 34°58.6'N 141°36.7'W	1109 32°46.1'N 142°13.3'W	1230 33°25'N 141°41'W	1300 30°55'N 139°13'W
End Haul		1750 35°07.2'N 141°53.0'W	1906 32°51.4'N 141°59.9'W	1830 33°25'N 141°45'W	1930 30°57'N 139°26'W
First Float Hauled:		Last Set	First Set	Last Set	First Set
Total No. Hooks	6 Lines	740 (includes 16 art. bait)	1,039 (includes 42 art. bait)	1,242	1,000
Type of Hook		#4,7 M. Circle, #34 JLL	#7 M. Circle, #9 M.B.C.	#7 M. Circle	#5 M. Circle
No. of Baskets		27	25	26	22
Buoy Line Lengths		72 ft.	150, 300 ft.	3, 75, 150, 300 ft.	210, 300 ft.
Sea Surface Temp.	66°F	64°F	66.5°F	65°F	69°F
Mixed Layer Depth	200 ft.	200, 210 ft.	220 ft.	NR	NR
Wind: Speed Direction	5 kts. 270°	5-10 kts. 280°	5 kts. 260°	3 kts. 270°	10 kts. 280°
Sea/Swell: Height Direction	5 ft. 270°	8-12 ft. 270°	4-6 ft. 290°	4 ft. 270°	2 ft. 290°
Catch: Albacore	Ø	13 LL (3 Jig)	1	2	1
Alb. Catch Rate (per 100 Hooks)		1.76	0.10	0.19	0.10
Catch: Bigeye		1	2	9	Ø
Catch: Sharks		Ø	Ø	1 Blue	Ø
Catch: Other		2 Pelagic Rays	4 Wahoo	1 Wahoo	4 YF, 2 Wahoo 1 Mahi-Mahi 1 Opah, 3 Alep.
Lost/Broken Hooks		5	6	NR	NR
Twisted Gangion		Ø	1	NR	NR
Alb. Lost at Surface		Ø	Ø	NR	NR

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NOVEMBER 23

	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	7	6	7	8	5
Time and Position: Start Set	0858 35°56'N 158°34'W	0750 35°15.0'N 141°38.5'W	0753 34°34.9'N 141°59.7'W	0750 33°39'N 142°02'W	0800 30°43'N 140°19'W
End Set	1038 36°04'N 158°24'W	0910 35°08.7'N 141°25.0'W	0857 34°35.3'N 141°56.6'W	0920 33°40'N 142°07'W	1030 30°43'N 140°26'W
Course of Set	045°	120°	075°	290°	270°
Time and Position: Start Haul	1830 36°04'N 158°24'W	1340 35°11.3'N 141°26.1'W	1101 34°34.0'N 141°48.7'W	1300 32°40'N 142°05'W	1300 30°43'N 140°19'W
End Haul	2245 35°56'N 158°34'W	2000 35°14'N 141°30'W	1850 34°33.0'N 141°59.0'W	1815 33°40'N 141°59'W	2000 30°43'N 140°26'W
First Float Hauled:	Last Set	Last Set (switched ends after 8 skates)	Last Set	Last Set	First Set
Total No. Hooks	845	605 (+180 lost) (includes 10 art. bait)	1,048 (includes 41 art. bait)	1,036	1,000
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle	#4,7 M. Circle, #34 JLL	#7 M. Circle, #9 M.B.C.	#7 M. Circle	#5 M. Circle
No. of Baskets	13	23 Hauled (+6 Lost)	25	22	25
Buoy Line Lengths	200, 300 ft.	72 ft.	75, 150, 300 ft.	75, 150 ft.	450, 600 ft.
Sea Surface Temp.	64°F	64.5°F	64°F	65°F	69°F
Mixed Layer Depth	200 ft.	220 ft.	240 ft.	NR	270, 210 ft.
Wind: Speed	25-30 kts.	18 kts.	5-10 kts.	10 kts.	10 kts.
Direction	220°	180°	160°	135°	090°
Sea/Swell: Height	8-10 ft.	4 ft.	4-6 ft.	5 ft.	4 ft.
Direction	220°	270°	170°	180°	290°
Catch: Albacore	2	17 LL (1 Jig)	4	1	Ø
Alb. Catch Rate (per 100 Hooks)	0.24	2.81	0.38	0.10	Ø
Catch: Bigeye	Ø	Ø	Ø	9	Ø
Catch: Sharks	2 Blue	1 Blue	1 Blue	Ø	Ø
Catch: Other	2 Mahi-Mahi 1 Ray 5 Alep.	1 Opah, 1 Alep., 3 Pelagic Rays (3 S.J. trolling)	Ø	2 Wahoo 1 Swordfish	9 Yellowfin 2 Mahi-Mahi
Lost/Broken Hooks	2	5	1	NR	NR
Twisted Gangion	Ø	Ø	1	NR	NR
Alb. Lost at Surface	Ø	2	Ø	NR	NR

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	8	No Set - Trolling & Searching for Lost Gear	8	9	No Set Trolling
Time and Start Set	1014		0900	0815	
Position:	35°16'N 158°59'W	35°15'N 141°26'W	35°15'N 141°28'W	33°53'N 142°02'W	31°50'N 140°45'W
End Set	1154		1002	0915	
	35°13'N 158°50'W	35°25'N 141°30'W	35°19'N 141°26'W	34°00'N 142°05'W	33°00'N 140°30'W
Course of Set	110°	Zig-Zagging	340°	340°	
Time and Start Haul	1515		1117	1140	
Position:	35°13'N 158°50'W		35°24'N 141°25'W	34°00'N 142°03'W	
End Haul	1930		1758	1400	
	35°16'N 158°59'W		35°20'N 141°27'W	33°55'N 142°02'W	
First Float Hauled:	Last Set		Last Set	Last Set	
Total No. Hooks	700	6 Lines	1,002 (includes 43 art. bait)	593	10 Lines
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle		#7 M. Circle, #9 M.B.C.	#7 M. Circle	
No. of Baskets	17		24	13	
Buoy Line Lengths	200 ft. (1 of 100 ft.)		75, 150 ft.	150, 300 ft. (1)	
Sea Surface Temp.	64°F	63.5°F	63.5°F	65°F	68°F
Mixed Layer Depth	210 ft.	NR	210 ft.	NR	230 ft.
Wind: Speed	20 kts.	25-30 kts.	25-30 kts.	20 kts.	25-30 kts.
Direction	310°	140°	160°	160°	160°
Sea/Swell: Height	8 ft.	12 ft.	8-10 ft.	10-12 ft.	12 ft.
Direction	310°	160°	150°	180°	160°
Catch: Albacore	4	14	13	Ø	Ø
Alb. Catch Rate (per 100 Hooks)	0.57		1.30	Ø	
Catch: Bigeye	Ø		Ø	Ø	
Catch: Sharks	1 Blue		Ø	Ø	
Catch: Other	1 Alep.		1 Mahi-Mahi	Ø	
Lost/Broken Hooks	Ø		1	NR	
Twisted Gangion	Ø		1	NR	
Alb. Lost at Surface	Ø		Ø	NR	

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	9	7	9	No Set Trolling	6
Time and Start Set	0931	0920	0905		0930
Position:	34°40'N 159°48'W	35°21.1'N 141°32.5'W	35°17'N 141°37'W	33°56'N 141°30'W	34°55'N 140°03'W
End Set	1125	1035	0958		1100
	34°42'N 159°35'W	35°22.0'N 141°24.4'W	35°16'N 141°46'W	35°10'N 141°31'W	35°05'N 140°00'W
Course of Set	085°	090°	250°		340°
Time and Start Haul	1415	1230	1133		1300
Position:	34°42'N 159°33'W	35°21.5'N 141°25.6'W	35°17'N 141°37'W		34°55'N 140°03'W
End Haul	1915	1630	1857		1700
	34°40'N 159°48'W	35°22.1'N 141°31.8'W	35°18'N 141°41'W		35°05'N 140°00'W
First Float Hauled:	Last Set	Last Set	First Set		First Set
Total No. Hooks	967	629 (includes 9 art. bait)	921 (includes 43 art. bait)	10 Lines	675
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle	#4,7 M. Circle, #34 JLL	#7 M. Circle, #9 M.B.C.		#5 M. Circle
No. of Baskets	17	24	22		15
Buoy Line Lengths	200 ft.	72 ft.	75, 150 ft.		150 ft.
Sea Surface Temp.	65°F	63.5°F	63.5°F	64.5°F	64°F
Mixed Layer Depth	240 ft.	190 ft.	200 ft.	NR	190 ft.
Wind: Speed	25-30 kts.	5 kts.	5 kts.	10 kts.	20 kts.
Direction	230°	045°	020°	020°	000°
Sea/Swell: Height	6 ft.	10 ft.	3-5 ft.	6-8 ft.	15 ft.
Direction	230°	270°	210°	180°	000°
Catch: Albacore	10	2 LL (9 trolling)	5	12	4
Alb. Catch Rate (per 100 Hooks)	1.03	0.32	0.54		0.59
Catch: Bigeye	Ø	Ø	Ø		Ø
Catch: Sharks	2 Blue	Ø	Ø		Ø
Catch: Other	1 Pelagic Ray 2 Alep.	1 Alep. 1 Pelagic Ray	2 Mahi-Mahi 3 Pelagic Rays		Ø
Lost/Broken Hooks	1	1	4		NR
Twisted Gangion	Ø	Ø	Ø		NR
Alb. Lost at Surface	Ø	1	Ø		NR

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	10	8	10	10	7
Time and Start Set	1012	0820	0755	0800	0730
Position:	34°34'N 159°26'W	35°30.4'N 141°42.8'W	35°40'N 141°41'W	35°23'N 141°28'W	34°57'N 141°07'W
End Set	1234	0930	0902	0930	1000
	34°34'N 159°30'W	35°31.0'N 141°34.3'W	35°40'N 141°31'W	35°25'N 141°20'W	35°01'N 140°53'W
Course of Set	270°	090°	075°	075°	075°
Time and Start Haul	1600	1215	1103	NR	1300
Position:	34°34'N 159°26'W	35°29.0'N 141°32.8'W	35°40'N 141°31'W	35°26'N 141°18'W	35°03'N 141°04'W
End Haul	2030	1710	1915	NR	1930
	34°34'N 159°30'W	35°28.7'N 141°38.8'W	35°41'N 141°40'W	35°26'N 141°26'W	35°07'N 140°50'W
First Float Hauled:	First Set	Last Set	Last Set	Last Set	First Set
Total No. Hooks	1,068	607 (includes 4 art. bait)	1,095 (includes 43 art. bait)	1,006	1,000
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle	#4,7 M. Circle, #34 JLL	#7 M. Circle, #9 M.B.C.	#7 M. Circle	#5 M. Circle
No. of Baskets	22	25	26	22	24
Buoy Line Lengths	100, 200 ft.	72, 42 ft. (1)	75 ft.	75, 150, 3 ft. (1)	150, 300 ft. (4)
Sea Surface Temp.	65°F	63.5°F	63°F	63°F	64.5°F
Mixed Layer Depth	230 ft.	200 ft.	NR	NR	215 ft.
Wind: Speed	20 kts.	20-30 kts.	25 kts.	25 kts. +	30-35 kts.
Direction	270°	270-250°	250°	250°	250°
Sea/Swell: Height	5 ft.	10-12 ft.	8-10 ft.	10-12 ft.	15 ft.
Direction	270°	250°	250°	250°	250°
Catch: Albacore	8	11	13	10	25
Alb. Catch Rate (per 100 Hooks)	0.75	1.81	1.19	0.99	2.50
Catch: Bigeye	Ø	Ø	Ø	Ø	Ø
Catch: Sharks	1 Blue	Ø	Ø	Ø	Ø
Catch: Other	1 Wahoo 1 Alep. 1 Pelagic Ray	Ø	1 Pelagic Ray	1 Mahi-Mahi	Ø
Lost/Broken Hooks	Ø	9	5	NR	NR
Twisted Gangion	Ø	Ø	2	NR	NR
Alb. Lost at Surface	1	Ø	Ø	NR	NR

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	11	9	11	11	8
Time and Start Set	0803	0800	0755	0800	0830
Position:	34°39'N 159°13'W	35°33.1'N 141°56.8'W	35°54'N 141°28'W	35°27'N 141°35'W	34°52'N 141°12'W
End Set	1017	0915	0900	0945	1000
	34°43'N 159°19'W	35°36.4'N 141°47.9'W	35°53'N 141°20'W	35°26'N 141°31'W	34°53'N 141°22'W
Course of Set	315°	070°	090°	090°	270°
Time and Start Haul	1310	1310	1103	NR	1300
Position:	34°39'N 159°13'W	35°33.9'N 141°45.5'W	35°54'N 141°19'W	35°26'N 141°29'W	34°53'N 141°22'W
End Haul	1730	1700	1837	1845	1900
	34°43'N 159°19'W	35°32.6'N 141°55.2'W	35°54'N 141°27'W	35°26'N 141°31'W	34°52'N 141°12'W
First Float Hauled:	First Set	Last Set	Last Set	Last Set	Last Set
Total No. Hooks	1,089	637 (includes 8 art. bait)	1,041 (includes 41 art. bait)	1,200	1,000
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle	#4,7 M. Circle, #34 JLL	#7 M. Circle, #9 M.B.C.	#7 M. Circle	#5 M. Circle
No. of Baskets	20	26	25	27	23
Buoy Line Lengths	200 ft.	72 ft.	75, 150, 300 ft. (1)	75, 150, 300 ft.	240 ft.
Sea Surface Temp.	66°F	64.5°F	63°F	63.5°F	64°F
Mixed Layer Depth	250 ft.	240 ft.	230 ft.	NR	220 ft.
Wind: Speed	20 kts.	20 kts.	20 kts.	15 kts.	15-20 kts.
Direction	240°	230°	250°	270°	250°
Sea/Swell: Height	6 ft.	10 ft.	8-10 ft.	8-10 ft.	8-10 ft.
Direction	240°	270°	260°	270°	270°
Catch: Albacore	6	11 LL (4 trolling)	10	21	27
Alb. Catch Rate (per 100 Hooks)	0.55	1.73	0.96	1.75	2.70
Catch: Bigeye	3	Ø	Ø	1	Ø
Catch: Sharks	1 Blue	Ø	Ø	Ø	Ø
Catch: Other	1 Wahoo 2 Alepisaurus	1 Pelagic Ray	Ø	1 Pelagic Ray	Ø
Lost/Broken Hooks	Ø	3	4	NR	NR
Twisted Gangion	Ø	Ø	3	NR	NR
Alb. Lost at Surface	Ø	Ø	Ø	NR	NR

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	12	10	12	12	9
Time and Start Set	0845	0815	0800	0800	0800
Position:	35°03'N 158°40'W	35°29.6'N 141°27.4'W	35°36'N 141°04'W	35°17'N 141°15'W	34°41'N 141°16'W
End Set	1130	0920	0904	0915	1000
	35°08'N 158°47'W	35°30.0'N 141°18.7'W	Not Taken	35°14'N 141°07'W	34°43'N 141°04'W
Course of Set	315°	090°	090°	110°	110°
Time and Start Haul	1530	1300	1105	1300	1400
Position:	35°03'N 158°40'W	35°27.1'N 141°19.0'W	35°33'N 140°54'W	35°14'N 141°04'W	34°43'N 141°04'W
End Haul	2100	1755	1844	1750	1900
	35°08'N 158°47'W	35°28.3'N 141°26.9'W	35°33'N 141°06'W	35°12'N 141°13'W	34°41'N 141°16'W
First Float Hauled:	First Set	Last Set	Last Set	Last Set	Last Set
Total No. Hooks	1,129	653 (includes 2 art. bait)	1,056 (includes 43 art. bait)	1,038	1,000
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle	#4,7 M. Circle, #34 JLL	#7 M. Circle, #9 M.B.C.	#7 M. Circle	#5 M. Circle
No. of Baskets	23	27	25	22	19
Buoy Line Lengths	200, 300 ft.	72, 60, 30, 18 ft.	75, 150, 300 ft. (1)	150, 300 ft.	240 ft.
Sea Surface Temp.	65.5°F	64°F	63°F	63°F	64°F
Mixed Layer Depth	250 ft.	260, 240 ft.	240 ft.	NR	190 ft.
Wind: Speed	20 kts.	25 kts.	20-25 kts.	20 kts. +	25 kts.
Direction	220°	240°	230°	250°	250°
Sea/Swell: Height	6 ft.	10-12 ft.	12-15 ft.	10-12 ft.	10-13 ft.
Direction	220°	240°	250°	250°	270°
Catch: Albacore	49	11 LL (1 trolling)	Ø	11	20
Alb. Catch Rate (per 100 Hooks)	4.34	1.68	Ø	1.06	2.00
Catch: Bigeye	1	Ø	Ø	Ø	4
Catch: Sharks	Ø	Ø	Ø	Ø	Ø
Catch: Other	1 Opah 5 Alep.	2 Pelagic Rays 1-1/2 Alep.	Ø	Ø	2 Alep.
Lost/Broken Hooks	Ø	2	Ø	NR	NR
Twisted Gangion	Ø	Ø	Ø	NR	NR
Alb. Lost at Surface	3	1	Ø	NR	NR

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	13	No Set Trolling	13	No Set Trolling	No Set Trolling
Time and Start Set Position:	0811 35°03'N 158°33'W	32°28'N 142°24'W	0804 34°42'N 140°40'W	34°32'N 140°32'W	34°37'N 141°59'W
End Set	0958 35°08'N 158°41'W	35°10'N 143°40'W	0906 34°35'N 140°38'W	34°35'N 139°58'W	34°20'N 142°55'W
Course of Set	315°		090°		
Time and Start Haul Position:	1515 35°08'N 158°41'W		1106 34°40'N 140°32'W		
End Haul	2100 35°03'N 158°33'W		1815 34°41'N 140°38'W		
First Float Hauled:	Last Set		Last Set		
Total No. Hooks	1,152	6 Lines	999 (includes 41 art. bait)	10 Lines	10 Lines
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle		#7 M. Circle, #9 M.B.C.		
No. of Baskets	29		24		
Buoy Line Lengths	200, 300 ft.		150, 225, 300 ft.		
Sea Surface Temp.	65.5°F	64°F	63.5°	62.5°F	64.5°F
Mixed Layer Depth	240 ft.	200 ft.	230 ft.	NR	NR
Wind: Speed Direction	10 kts. 240°	20-25 kts. 240°	25 kts. 240°	25 kts. 250°	25-30 kts. 270°
Sea/Swell: Height Direction	5 ft. 240°	8-10 ft. 240°	10-12 ft. 260°	10 ft. 250°	8-12 ft. 270°
Catch: Albacore	84	30	14	36	6
Alb. Catch Rate (per 100 Hooks)	7.29		1.40		
Catch: Bigeye	1		Ø		
Catch: Sharks	1 Blue		Ø		
Catch: Other	2 Yellowfin 6 Alep. (2 S.J. trolling)		1 Wahoo 1 Alep.		
Lost/Broken Hooks	1		2		
Twisted Gangion	2		Ø		
Alb. Lost at Surface	2		1		

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	14	11	14	13	10
Time and Start Set	0756	0758	0800	0750	0800
Position:	35°06'N 158°29'W	34°48.4'N 145°16.6'W	34°44'N 140°50'W	34°29'N 139°51'W	34°17'N 143°45'W
End Set	0945	0915	0844	0925	0930
	35°08'N 158°36'W	34°48.5'N 145°08.8'W	34°41'N 140°44'W	34°24'N 139°45'W	34°18'N 143°59'W
Course of Set	290°	070°	085°	135°	260°
Time and Start Haul	1815	1215	1208	1300	1330
Position:	35°06'N 158°29'W	34°48.1'N 145°06.9'W	34°42'N 140°44'W	34°23'N 139°43'W	34°17'N 143°45'W
End Haul	2130	2019	1725	1845	1800
	35°08'N 158°36'W	34°45'N 145°14'W	34°42'N 140°48'W	34°29'N 139°48'W	34°18'N 143°59'W
First Float Hauled:	First Set	Last Set (5 skates hauled then reset on other end, return to haul)	Last Set	Last Set	First Set
Total No. Hooks	1,132	812 (134 hooks were hauled and reset)(includes 11 art. bait)	716 (includes 43 art. bait)	1,215	1,000
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle	#4,7 M. Circle, #34 JLL	#7 M. Circle, #9 M.B.C.	#7 M. Circle	#5 M. Circle
No. of Baskets	24	32 (5 hauled & reset)	17	27	21
Buoy Line Lengths	200, 300 ft.	18, 42, 72 ft.	150, 225 ft.	150, 300 ft.	240 ft.
Sea Surface Temp.	66°F	65°F	63.5°F	64°F	65°F
Mixed Layer Depth	230, 260 ft.	220 ft.	220 ft.	NR	240, 200 ft.
Wind: Speed	15 kts.	10 kts.	10-15 kts.	18-20 kts.	10 kts.
Direction	200°	240°	290°	290°	270°
Sea/Swell: Height	5 ft.	10 ft.	8-10 ft.	10 ft.	5 ft.
Direction	200°	250°	320°	290°	270°
Catch: Albacore	63	60 LL (6 trolling)	1 LL (4 trolling)	12	16
Alb. Catch Rate (per 100 Hooks)	5.57	7.39	0.14	0.99	1.60
Catch: Bigeye	2	1	1	Ø	Ø
Catch: Sharks	1 Blue	Ø	Ø	Ø	Ø
Catch: Other	4 Alep.	5 Mahi-Mahi, 1 Alep. 1 Yellowtail 1 Pelagic Ray	2 Alep.	Ø	1 Mahi-Mahi 1 Alep.
Lost/Broken Hooks	1	4	Ø	NR	NR
Twisted Gangion	5	3	1	NR	NR
Alb. Lost at Surface	1	Ø	Ø	NR	NR

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	15	12	No Set Trolling	No Set Trolling	No Set Trolling
Time and Start Set	0915	0815			
Position:	35°15'N 158°35'W	34°47.7'N 145°24.1'W	34°47'N 142°47'W	34°33'N 141°26'W	33°41'N 145°07'W
End Set	1057	0925			
	35°12'N 158°34'W	34°50.3'N 145°15.6'W	34°39'N 144°03'W	34°38'N 142°40'W	33°50'N 145°45'W
Course of Set	170°	070°			
Time and Start Haul	1500	1115			
Position:	35°15'N 158°35'W	34°48.2'N 145°21.0'W			
End Haul	1900	1700			
	35°12'N 158°34'W	34°45.8'N 145°20.1'W			
First Float Hauled:	First Set	Began @ First Set, switched after 3 skates to last set.			
Total No. Hooks	1,027	718 (includes 15 art. bait)	10 Lines	10 Lines	10 Lines
Type of Hook	#8 M. Circle, #34 JLL, #30 J Circle	#4,7 M. Circle, #34 JLL			
No. of Baskets	18	27			
Buoy Line Lengths	200, 300 ft.	18, 30, 72 ft.			
Sea Surface Temp.	66°F	65°F	63°F	67.5°F	66°F
Mixed Layer Depth	240, 280 ft.	200 ft.	190 ft.	NR	200 ft.
Wind: Speed	25 kts.	25 kts.	10-12 kts.	12 kts.	15 kts.
Direction	180°	180°	225°	225°	225°
Sea/Swell: Height	8 ft.	10 ft.	4-6 ft.	5-6 ft.	8 ft.
Direction	180°	220°	230°	250°	225°
Catch: Albacore	29	62 LL (1 trolling)	5	9	1
Alb. Catch Rate (per 100 Hooks)	2.82	8.64			
Catch: Bigeye	1	Ø			
Catch: Sharks	Ø	1 Mako			
Catch: Other	1 Alep.	18 Mahi-Mahi 3 Pelagic Rays (1 Mahi-Mahi trolling)			
Lost/Broken Hooks	Ø	12			
Twisted Gangion	4	2			
Alb. Lost at Surface	3	3			

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	16	13	15	No Set Trolling	11
Time and Start Set	0902	0820	0805		0830
Position:	35°06'N 158°29'W	34°43.0'N 145°23.6'W	34°38'N 145°25'W	34°40'N 144°02'W	33°56'N 146°20'W
End Set	1105	0925	0932		1030
	35°17'N 158°24'W	34°50.8'N 145°20.0'W	34°44'N 145°15'W	34°34'N 145°10'W	34°07'N 146°20'W
Course of Set	025°	015°	030°		000°
Time and Start Haul	1430	1215	1100		1300
Position:	35°06'N 158°29'W	34°47.7'N 145°17.6'W	34°44'N 145°15'W		34°07'N 146°20'W
End Haul	1830	1730	2116		2030
	35°17'N 158°24'W	34°43.4'N 145°23.2'W	No Position		33°56'N 146°20'W
First Float Hauled:	First Set	Last Set	Last Set		Last Set
Total No. Hooks	1,028	791 (includes 17 art. bait)	1,434 (includes 42 art. bait)	10 Lines	1,300
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle	#4, 7 M. Circle, #34 JLL	#7 M. Circle, #9 M.B.C.		#5 M. Circle
No. of Baskets	21	27	34		31
Buoy Line Lengths	200, 300 ft.	18 ft.	18 ft.		240, 150 ft. (8)
Sea Surface Temp.	66°F	64.5°F	64.5°F	64.5°F	66°F
Mixed Layer Depth	240 ft.	240 ft.	230 ft.	NR	250 ft.
Wind: Speed	25-30 kts.	35-40 kts.	25 kts.	25 kts. +	30 kts.
Direction	000°	160°	130°	180°	170°
Sea/Swell: Height	8 ft.	12-14 ft.	10-15 ft.	8-10 ft.	12-15 ft.
Direction	000°	180°	160°	180°	180°
Catch: Albacore	20	40	27	12	7
Alb. Catch Rate (per 100 Hooks)	1.95	5.06	1.88		0.54
Catch: Bigeye	1	1	Ø		1
Catch: Sharks	Ø	1 Blue	Ø		Ø
Catch: Other	4 Mahi-Mahi	23 Mahi-Mahi	4 Mahi-Mahi		3 Mahi-Mahi
	8 Alep.	2 Alep., 1 Yellowtail	1 Wahoo		3 Wahoo, 4 Alep.
	1 Pelagic Ray	1 Pelagic Ray			1 Pelagic Stingray
Lost/Broken Hooks	Ø	13	3		NR
Twisted Gangion	3	4	4		NR
Alb. Lost at Surface	1	3	Ø		NR

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DECEMBER 3

	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	17	14	16	14	12
Time and Start Set	0918	1000	0840	0820	0830
Position:	35°05'N 158°40'W	34°45.8'N 145°25.2'W	34°43'N 145°14'W	34°46'N 145°14'W	34°48'N 146°11'W
End Set	1119	1105	0934	1000	1000
	35°02'N 158°45'W	34°47.1'N 145°30.4'W	No Position	34°44'N 145°27'W	34°55'N 146°12'W
Course of Set	225°	Set in a half circle	070°	290°	350°
Time and Start Haul	1345	1315	1148	1300	1300
Position:	35°05'N 158°40'W	34°43.0'N 145°23.7'W	34°42'N 145°15'W	34°44'N 145°27'W	34°48'N 146°11'W
End Haul	2000	1830	1758	1945	1800
	35°02'N 158°45'W	34°47.6'N 145°29.9'W	34°44'N 145°13'W	34°47'N 145°13'W	34°55'N 146°12'W
First Float Hauled:	First Set	First Set	First Set	Last Set	First Set
Total No. Hooks	1,173	692 (includes 15 art. bait)	834	1,441	1,000
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle	#4, 7 M. Circle, #34 JLL	#7 M. Circle, #9 M.B.C.	#7 M. Circle	#5 M. Circle
No. of Baskets	26	26	20	30	20
Buoy Line Lengths	100, 200, 300 ft.	18 ft. (3 @ 72 ft.)	18 ft.	Mixed 20-60 ft., 150 ft. (2)	240 ft.
Sea Surface Temp.	65°F	65°F	64.5°F	65°F	65°F
Mixed Layer Depth	240 ft.	240, 220 ft.	230 ft.	NR	270 ft.
Wind: Speed	10 kts.	10-20 kts.	15 kts.	10 kts.	15 kts.
Direction	220°	010°	000°	045°	000°
Sea/Swell: Height	5 ft.	8-10 ft.	6-8 ft.	8 ft.	6 ft.
Direction	050°	270° and 000°	020°	180°	000°
Catch: Albacore	33	27 LL (5 trolling)	16	39	21 LL (11 trolling)
Alb. Catch Rate (per 100 Hooks)	2.81	3.90	1.92	2.71	2.10
Catch: Bigeye	Ø	Ø	Ø	Ø	Ø
Catch: Sharks	Ø	Ø	Ø	Ø	Ø
Catch: Other	1 Mahi-Mahi 3 Pelagic Rays 2 Alep.	9 Mahi-Mahi (2 Yellowtail trolling)	3 Mahi-Mahi	20 Mahi-Mahi	3 Mahi-Mahi
Lost/Broken Hooks	Ø	5	1	NR	NR
Twisted Gangion	2	3	7	NR	NR
Alb. Lost at Surface	1	1 (+2 shark bit)	1	NR	NR

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DECEMBER 4

	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	18	15	17	15	13
Time and Start Set	0813	0830	0805	0810	0830
Position:	34°49'N 158°35'W	35°03.1'N 145°52.0'W	34°56'N 145°41'W	34°52'N 145°30'W	34°36'N 146°28'W
End Set	0956	0945	0908	0950	1000
	35°02'N 158°40'W	34°58.1'N 145°47.5'W	34°50'N 145°43'W	34°44'N 145°26'W	34°36'N 146°35'W
Course of Set	315°	130°	180°	160°	270°
Time and Start Haul	1440	1240	1135	1300	1400
Position:	34°49'N 158°35'W	34°57.6'N 145°46.2'W	34°42'N 145°41'W	34°44'N 145°25'W	34°36'N 146°28'W
End Haul	1930	1715	1955	1900	1830
	35°02'W 158°40'W	35°02.9'N 145°50.9'W	34°54'N 145°40'W	34°52'W 145°29'W	34°36'N 146°35'W
First Float Hauled:	First Set	Last Set	Last Set	Last Set	First Set
Total No. Hooks	1,093	729 (includes 14 art. bait)	1,049 (includes 41 art. bait)	1,450	1,000
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle	#4, 7 M. Circle, #34 JLL	#7 M. Circle, #9 M.B.C.	#7 M. Circle	#5 M. Circle
No. of Baskets	22	26	25	30	22
Buoy Line Lengths	300, 400 ft.	18, 72 ft. (5)	18 ft.	18-48 ft.	240, 150, 300 ft.
Sea Surface Temp.	65°F	64.5°F	64°F	65°F	64°F
Mixed Layer Depth	240, 280 ft.	200, 190 ft.	190 ft.	NR	200 ft.
Wind: Speed	15 kts.	10 kts.	10 kts.	10 kts.	10-15 kts.
Direction	310°	010°	270°	315°	270°
Sea/Swell: Height	5 ft.	6 ft.	6 ft.	6 ft.	4 ft.
Direction	310°	000°	290°	250°	270°
Catch: Albacore	20 LL (1 trolling)	37 LL (8 trolling)	25 LL (6 trolling)	31	21 LL (16 trolling)
Alb. Catch Rate (per 100 Hooks)	1.83	5.08	2.38	2.14	2.10
Catch: Bigeye	Ø	Ø	Ø	Ø	Ø
Catch: Sharks	Ø	1 Blue	Ø	Ø	Ø
Catch: Other	10 Alep.	2 Alep. 1 Mahi-Mahi	3 Mahi-Mahi	12 Mahi-Mahi	1 Yellowfin 2 Alep.
Lost/Broken Hooks	1	4	4	NR	NR
Twisted Gangion	1	2	11	NR	NR
Alb. Lost at Surface	Ø	Ø	1	NR	NR

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	19	16	18	16	14
Time and Start Set	0839	0920	0814	0815	0900
Position:	34°11'N 158°25'W	34°51.3'N 146°00.5'W	34°52'N 145°52'W	34°51'N 145°47'W	34°25'N 147°56'W
End Set	1100	1045	0910	0950	1000
	34°12'N 158°40'W	34°44.5'N 145°57.0'W	34°45'N 145°54'W	34°43'N 145°49'W	34°24'N 147°52'W
Course of Set	270°	140°	175°	190°	090°
Time and Start Haul	1420	1340	1114	1230	1330
Position:	34°11'N 158°25'W	34°44.2'N 145°55.9'W	34°44'N 145°52'W	34°51'N 145°48'W	34°25'N 147°56'W
End Haul	1930	1910	1822	1830	1930
	34°12'N 158°40'W	34°43.6'N 145°55.5'W	34°44'N 145°53'W	34°43'N 145°50'W	34°24'N 147°52'W
First Float Hauled:	First Set	Began at last set, switched to first set after 3 skates.	Last Set	First Set	First Set
Total No. Hooks	1,048	780 (includes 12 art. bait)	1,045	1,497	1,000
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle	#4, 7 M. Circle, #34 JLL	#7 M. Circle, #9 M.B.C.	#7 M. Circle	#5 M. Circle
No. of Baskets	24	28	25	29	25
Buoy Line Lengths	200, 300 ft.	18, 72 ft. (4)	18 ft.	18-60 ft.	150, 300 ft. (2)
Sea Surface Temp.	65°F	64°F	64°F	64°F	65°F
Mixed Layer Depth	260, 280 ft.	220, 190 ft.	210 ft.	NR	190 ft.
Wind: Speed	30-35 kts.	5-10 kts.	5 kts.	7 kts.	10-15 kts.
Direction	180°	090°	020°	045°	090°
Sea/Swell: Height	10 ft.	4 ft.	4 ft.	3 ft.	2 ft.
Direction	180°	200°	320°	315°	090°
Catch: Albacore	12	9 LL (4 trolling)	13 LL	20	43
Alb. Catch Rate (per 100 Hooks)	1.15	1.15	1.24	1.34	4.30
Catch: Bigeye	Ø	Ø	Ø	Ø	Ø
Catch: Sharks	Ø	Ø	Ø	Ø	Ø
Catch: Other	2 Wahoo 6 Alep. 1 Yellowfin	3 Mahi-Mahi 1 Pelagic Ray 4 Alep.	1 Mahi-Mahi 1 Wahoo (1 S.J. trolling)	7 Mahi-Mahi	2 Alep
Lost/Broken Hooks	Ø	3	Ø	NR	NR
Twisted Gangion	Ø	Ø	Ø	NR	NR
Alb. Lost at Surface	Ø	1 (also 1 Mahi)	Ø	NR	NR

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	20	No Set Trolling	19	17	15
Time and Start Set Position:	0722 33°46'N 158°27'W	34°35'N 145°30'W	0815 34°31'N 145°13'W	0820 34°39'N 144°58'W	0900 34°37'N 148°04'W
End Set	0849 33°52'N 158°33'W	34°30'N 144°45'W	0852 34°34'N 145°14'W	0920 34°33'N 145°02'W	1100 34°32'N 148°00'W
Course of Set	315°		340°	200°	135°
Time and Start Haul Position:	1330 33°46'N 158°27'W		1100 34°36'N 145°16'W	1300 34°34'N 145°04'W	1400 34°37'N 148°04'W
End Haul	NR 33°52'N 158°33'W		1448 34°35'N 145°15'W	1630 34°34'N 144°59'W	1900 34°32'N 148°00'W
First Float Hauled:	First Set		Last Set	Last Set	First Set
Total No. Hooks	854	6 Lines	619	758	1,000
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle		#7 M. Circle, #9 M.B.C.	#7 M. Circle	#5 M. Circle
No. of Baskets	21		15	15	22
Buoy Line Lengths	200, 300 ft.		18 ft.	18-90 ft.	150 ft.
Sea Surface Temp.	65°F	65°F	64.5°F	65°F	63°F
Mixed Layer Depth	230, 260 ft.	NR	230 ft.	NR	190 ft.
Wind: Speed Direction	10 kts. 290°	25-30 kts. 140°	25 kts. 135°	25 kts. + 135°	35 kts. 135°
Sea/Swell: Height Direction	7 ft. 270° & 290°	6-8 ft. 120°	8-10 ft. 130°	8-10 ft. 135°	10-13 ft. 135°
Catch: Albacore	16	4	11 LL (3 trolling)	13	22 LL (12 trolling)
Alb. Catch Rate (per 100 Hooks)	1.87		1.78	1.72	2.20
Catch: Bigeye	1(+1 lost at surface)		Ø	Ø	Ø
Catch: Sharks	Ø		Ø	Ø	Ø
Catch: Other	4 Yellowfin 4 Alep., 1 Wahoo 1 Pomfret		3 Mahi-Mahi 1 Yellowtail	9 Mahi-Mahi	2 Alep. 1 Pelagic Stingray
Lost/Broken Hooks	Ø		Ø	NR	NR
Twisted Gangion	Ø		Ø	NR	NR
Alb. Lost at Surface	Ø		Ø	NR	NR

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DECEMBER 7

	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	21	No Set Trolling	No Set Trolling	No Set Trolling	No Set Trolling
Time and Start Set Position:	0800 33°04'N 158°28'W	34°42'N 143°40'W	34°31'N 143°25'W	33°40'N 143°30'W	34°32'N 149°24'W
End Set	0955 33°05'N 158°21'W	34°20'N 142°05'W	34°28'N 142°17'W	33°33'N 142°27'W	34°31'N 150°10'W
Course of Set	085°				
Time and Start Haul Position:	1335 33°04'N 158°28'W				
End Haul	1755 33°05'N 158°21'W				
First Float Hauled:	First Set				
Total No. Hooks	922	6 Lines	5 Lines	10 Lines	8 Lines
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle				
No. of Baskets	21				
Buoy Line Lengths	200, 300 ft.				
Sea Surface Temp.	66°F	63.5°F	63.5°F	63.5°F	64°F
Mixed Layer Depth	230 ft.	200 ft.	190 ft.	NR	NR
Wind: Speed Direction	30 kts. 040°	20-25 kts. 120°	15-20 kts. 120°	20 kts. 160°	30-35 kts. 315°
Sea/Swell: Height Direction	6 ft. 040°	6 ft. 140°	4-6 ft. 140°	6 ft. 135°	8-12 ft. 315°
Catch: Albacore	Ø	Ø	2	3	20
Alb. Catch Rate (per 100 Hooks)	Ø				
Catch: Bigeye	Ø				
Catch: Sharks	Ø				
Catch: Other	5 Alep.		2 Mahi-Mahi		
Lost/Broken Hooks	Ø				
Twisted Gangion	Ø				
Alb. Lost at Surface	Ø				

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DECEMBER 8

	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	22	No Set Trolling	No Set Trolling	No Set Trolling	16
Time and Start Set Position: End Set	0751 33°47'N 158°34'W 0939 34°00'N 158°35'W	34°05'N 141°19'W 33°57'N 140°32'W	34°12'N 140°57'W 34°22'N 139°55'W	34°24'N 141°11'W 34°23'W 140°22'W	1000 34°21'N 150°57'W 1130 34°16'N 150°53'W
Course of Set	000°				135°
Time and Start Haul Position: End Haul	1400 33°47'N 158°34'W 2050 34°00'N 158°35'W				1400 34°21'N 150°57'W 1900 34°16'N 150°53'W
First Float Hauled:	First Set				First Set
Total No. Hooks	1,079	6 Lines	3 Lines	10 Lines	1,000
Type of Hook	#8 M. Circle, #34 JLL, #30 J. Circle				#5 M. Circle
No. of Baskets	24				17
Buoy Line Lengths	200, 300 ft.				150 ft.
Sea Surface Temp.	64.5°F	64.5°F	64°F	64°F	64°F
Mixed Layer Depth	270 ft.	NR	200 ft.	NR	220 ft.
Wind: Speed Direction	15-20 kts. 310°	30-40 kts. 140°	25-30 kts. 110°	25 kts. 135°	35 kts. 135°
Sea/Swell: Height Direction	4 ft. 310°	10-12 ft. 120°	15 ft. 120°	10-12 ft. 135°	8-11 ft. 135°
Catch: Albacore	7	5	10	5	14
Alb. Catch Rate (per 100 Hooks)	0.65				1.40
Catch: Bigeye	Ø				Ø
Catch: Sharks	Ø				Ø
Catch: Other	7 Alep. 1 Swordfsih	3 Mahi-Mahi	1 Mahi-Mahi		2 Alep. 1 Pelagic Stingray
Lost/Broken Hooks	Ø				NR
Twisted Gangion	Ø				NR
Alb. Lost at Surface	Ø				NR

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DECEMBER 9

	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	23	No Set Trolling	No Set Trolling	No Set Trolling	No Set Trolling
Time and Start Set Position:	0806 32°18'N 157°58'W	34°00'N 139°50'W	34°32'N 138°31'W	34°33'N 138°50'W	34°21'N 150°57'W
End Set	1000 32°25'N 158°05'W	34°02'N 138°45'W	34°24'N 137°05'W	34°20'N 137°34'W	34°05'N 151°35'W
Course of Set	315°				
Time and Start Haul Position:	1345 32°18'N 157°58'W				
End Haul	1900 32°25'N 158°05'W				
First Float Hauled:	First Set				
Total No. Hooks	1,118	6 Lines	3 Lines	10 Lines	10 Lines
Type of Hook	#8 M. Circle, #34 JLL				
No. of Baskets	24				
Buoy Line Lengths	200, 300 ft.				
Sea Surface Temp.	66°F	64.5°F	63.5°F	63.5°F	65°F
Mixed Layer Depth	250 ft.	NR	250 ft.	NR	NR
Wind: Speed Direction	25-30 kts. 250°	25 kts. 120°	20-25 kts. 120°	25 kts. 135°	25 kts. + 290°
Sea/Swell: Height Direction	6 ft. 270°	10 ft. 140°	8-10 ft. 140°	8-9 ft. 135°	6-8 ft. 270°
Catch: Albacore	6	4	30	9	15
Alb. Catch Rate (per 100 Hooks)	0.54				
Catch: Bigeye	Ø				
Catch: Sharks	2 Blue				
Catch: Other	6 Alep. 2 Pelagic Rays	3 Mahi-Mahi 1 Blue Marlin	3 Mahi-Mahi		
Lost/Broken Hooks	Ø				
Twisted Gangion	1				
Alb. Lost at Surface	Ø				

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	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	No Set Trolling	17	No Set Trolling	No Set Trolling	No Set Trolling
Time and Start Set		0830			
Position:	30°42'N 158°14'W	34°03.8'N 138°41.3'W	34°21'N 135°06'W	34°24'N 135°09'W	33°58'N 152°05'W
End Set	29°30'N 158°28'W	0945 34°01.6'N 138°32.6'W	34°14'N 133°46'W	34°18'N 133°52'W	33°35'N 153°00'W
Course of Set		095°			
Time and Start Haul		1230			
Position:		33°59.2'N 138°33.0'W			
End Haul		1700 34°03.0'N 138°42.0'W			
First Float Hauled:		Last Set			
Total No. Hooks	4 Lines	810 (includes 12 art. bait)	10 Lines	10 Lines	6 Lines
Type of Hook		#4,7 M. Circle, #34 JLL			
No. of Baskets		29			
Buoy Line Lengths		18, 72 ft. (6)			
Sea Surface Temp.	70°F	64°F	62°F	62°F	NR
Mixed Layer Depth	NR	290, 300 ft.	220 ft.	NR	NR
Wind: Speed	25-30 kts.	10 kts.	5 kts.	1 kt.	40 kts.
Direction	270°	240°	100°	225°	270°
Sea/Swell: Height	8 ft.	10 ft.	3 ft.	2 ft.	15-21 ft.
Direction	270°	240°	180°	225°	225°
Catch: Albacore	Ø	7 LL (13 trolling)	97	35	2
Alb. Catch Rate (per 100 Hooks)		0.86			
Catch: Bigeye		1			
Catch: Sharks		Ø			
Catch: Other		8 Mahi-Mahi 1 Pelagic Ray			
Lost/Broken Hooks		5			
Twisted Gangion		1			
Alb. Lost at Surface		Ø			

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DECEMBER 11

	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	No Set Trolling	No Set Trolling	No Set Trolling	No Set Trolling	No Set Trolling
Time and Start Set Position:	27°50'N 158°32'W	34°05'N 136°15'W	34°14'N 131°48'W	34°18'N 131°52'W	33°25'N 153°40'W
End Set	26°30'N 158°09'W	34°25'N 135°12'W	34°15'N 130°12'W	34°16'N 130°17'W	33°08'N 154°15'W
Course of Set					
Time and Start Haul Position:					
End Haul					
First Float Hauled:					
Total No. Hooks	5 Lines	6 Lines	10 Lines	10 Lines	6 Lines
Type of Hook					
No. of Baskets					
Buoy Line Lengths					
Sea Surface Temp.	71°F	64.5°F	61.5°F	61°F	64°F
Mixed Layer Depth	NR	270 ft.	220 ft.	NR	260ft.
Wind: Speed	15-20 kts.	15-20 kts.	10 kts.	5 kts.	25-30 kts.
Direction	340°	240°	180°	180°	270°
Sea/Swell: Height	4 ft.	6 ft.	4-5 ft.	4 ft.	15-17 ft.
Direction	340°	220°	210°	250°	270°
Catch: Albacore	Ø	43	32	21	Ø
Alb. Catch Rate (per 100 Hooks)					
Catch: Bigeye					
Catch: Sharks					
Catch: Other	1 Mahi-Mahi				
Lost/Broken Hooks					
Twisted Gangion					
Alb. Lost at Surface					

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DECEMBER 12

	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	24	No Set Trolling	No Set Trolling	No Set Trolling	17
Time and Start Set Position:	0740 24°58'N 157°34'W	34°30'N 133°20'W	34°14'N 128°21'W	34°22'N 128°14'W	0900 32°56'N 154°53'W
End Set	0926 25°03'N 157°23'W	34°11'N 132°28'W	34°16'N 126°50'W	34°15'N 126°49'W	1030 32°51'N 154°58'W
Course of Set	045°				225°
Time and Start Haul Position:	1400 24°58'N 157°34'W				1400 32°56'N 154°53'W
End Haul	1830 25°03'N 157°23'W				1900 32°51'N 154°58'W
First Float Hauled:	First Set				First Set
Total No. Hooks	721	6 Lines	10 Lines	10 Lines	1,000
Type of Hook	#8 M. Circle, #34 JLL				#5 M. Circle
No. of Baskets	20				21
Buoy Line Lengths	300, 400 ft.				240, 300 ft.
Sea Surface Temp.	74°F	62.5°F	61°F	62°F	65°F
Mixed Layer Depth	290 ft.	240 ft.	190 ft.	NR	260 ft.
Wind: Speed Direction	15-20 kts. 045°	20-25 kts. 340°	15 kts. 170°	10-15 kts. 225°	25-30 kts. 225°
Sea/Swell: Height Direction	5 ft. 045°	8 ft. 300°	4 ft. 200°	5 ft. 250°	15-18 ft. 225°
Catch: Albacore	3	29	6	8	2
Alb. Catch Rate (per 100 Hooks)	0.42				0.20
Catch: Bigeye	Ø				Ø
Catch: Sharks	Ø				Ø
Catch: Other	1 Escolar 1 Pelagic Ray		1 Skipjack		2 Wahoo 2 Alep. 2 Pelagic Stingrays
Lost/Broken Hooks	Ø				NR
Twisted Gangion	Ø				NR
Alb. Lost at Surface	Ø				NR

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DECEMBER 13

	PACIFIC PIONEER	NORCOASTER	RESOLUTE	ALASKA	ARROW
Set No.	No Set In Transit	No Set Trolling	No Set Trolling	No Set Trolling	No Set Trolling
Time and Start Set Position:	23°07'N 158°01'W	34°50'N 130°00'W	34°10'N 124°46'W	34°14'N 124°55'W	32°10'N 155°11'W
End Set		35°17'N 128°19'W	34°08'N 123°08'W	34°12'N 123°09'W	31°10'N 155°25'W
Course of Set					
Time and Start Haul Position:					
End Haul					
First Float Hauled:					
Total No. Hooks		7 Lines	5 Lines	10 Lines	6 Lines
Type of Hook					
No. of Baskets					
Buoy Line Lengths					
Sea Surface Temp.	76.5°F	60.5°F	59°F	59°F	66°F
Mixed Layer Depth	NR	230 ft.	230 ft.	NR	220 ft.
Wind: Speed	15-20 kts.	5 kts.	15-20 kts.	20 kts.	25 kts.
Direction	045°	110°	000°	340°	270°
Sea/Swell: Height	6 ft.	12 ft.	5 ft.	6-7 ft.	12-15 ft.
Direction	020°	290°	350°	315°	270°
Catch: Albacore		17	Ø	Ø	Ø
Alb. Catch Rate (per 100 Hooks)					
Catch: Bigeye					
Catch: Sharks					
Catch: Other					
Lost/Broken Hooks					
Twisted Gangion					
Alb. Lost at Surface					

JLL = Japanese Longline M. Circle = Mustad Circle J. Circle = Japanese Circle NR = No Record

	DECEMBER 14 ARROW	DECEMBER 15 ARROW	DECEMBER 16 ARROW
Set No.	No Set Trolling	18	19
Time and Start Set Position:	29°53'N 155°38'W	0900 29°01'N 155°27'W	0900 28°29'N 155°40'W
End Set	29°28'N 155°30'W	1030 29°06'N 155°34'W	1030 28°30'N 155°45'W
Course of Set		315°	270°
Time and Start Haul Position:		1400 29°01'N 155°27'W	1400 28°29'N 155°40'W
End Haul		1900 29°06'N 155°34'W	1800 28°30'N 155°45'W
First Float Hauled:		First Set	First Set
Total No. Hooks	6 Lines	1,000	750
Type of Hook		#5 M. Circle	#5 M. Circle
No. of Baskets		22	24
Buoy Line Lengths		450, 300 ft. (5)	300 ft.
Sea Surface Temp.	70°F	70°F	70°F
Mixed Layer Depth	200 ft.	280 ft.	300 ft.
Wind: Speed Direction	25-30 kts. 270°	25-30 kts. 270°	25-30 kts. 225°
Sea/Swell: Height Direction	8-11 ft. 270°	6-9 ft. 270°	6 ft. 270°
Catch: Albacore	Ø	Ø	Ø
Alb. Catch Rate (per 100 Hooks)	Ø	Ø	Ø
Catch: Bigeye		Ø	Ø
Catch: Sharks		Ø	Ø
Catch: Other		3 Yellowfin	Ø
Lost/Broken Hooks		NR	NR
Twisted Gangion		NR	NR
Alb. Lost at Surface		NR	NR

JLL = Japanese Longline M. Circle = Mustad Circle J. Circle = Japanese Circle NR = No Record